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# The Journal of the International College of Surgeons

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## Original Articles

# Commissurotomy for Mitral Stenosis

THOMAS J. E. O'NEILL, M.D., A.I.C.S., ROBERT P. GLOVER, M.D., AND CHARLES P. BAILEY, M.D., F.I.C.S.

PHILADELPHIA

DURING the past decade considerable interest has been developed in the problems offered by cardiac disorders. Striking advances have been made in the surgical treatment of congenital abnormalities. Complete restoration of anatomic relations has been accomplished in cases of patent ductus arteriosus, coarctation of the aorta, double aortic arch and other conditions. The early severe disabilities associated with the tetralogy of Fallot have been greatly mitigated by the shunt operations developed by Blalock and Potts. All have been accomplished with a respectably low mortality rate.

These advances have represented technics employed on the several vessels adjacent to the heart and have been the accompaniments of improved methods of anesthesia, expanded physiologic knowledge and progressive surgical thought.

It was inevitable and proper, therefore, that consideration should be directed toward surgical invasion into the heart chambers themselves. A still more vast field lies ahead in the innumerable instances of chronic valvular defects, both congenital and acquired.[1]

The mitral valve surpasses all the rest in its attractiveness for consideration. It is the one most often crippled by disease; further, it is the most accessible.

The responsible agent of disease is rheumatic infection, and either stenosis or insufficiency occurs as an end result. Frequently the two are coexistent. The stenotic valve lends itself more readily to surgical relief, and so naturally merits first attention.

Following upon abatement of the infection, a definite series of events occurs. The edges of the valve develop minute vegetations in a row along the line of closure of the leaflets. Healing is accompanied by fibrosis and thickening of the cusp edges, and in the process the cusps are laced together or fused at both the lateral and the medial orificial limbs. This line of fusion then properly becomes the commissures. They immobilize the cusps and destroy the valve action. A condition of stenosis exists. At this point anatomic examination reveals the valve to be a truncated cone with its apex pre-

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Fig. 1.—Instrument of recent design.

senting into the left ventricle and to consist of a thickened, fibrotic and even densely calcified ring, which is unyielding and is maintained in an open position through all phases of the cardiac cycle. The orifice is now greatly reduced in size, impeding the flow of blood.

This progression in stricture formation is reflected in the changing physical signs of the heart and matched by alterations in physiologic structure and function.

The left auricular pressure rises, and the amount of blood delivered to the left ventricle decreases. This results in a lowered cardiac output and in pulmonary venous hypertension. The increase in venous pressure is responsible for the associated dyspnea, cyanosis and hemoptysis. The pulmonary arterial system responds by elevation of the arterial pressure to values which are several times greater than the systemic arterial pressure, and so the right ventricle enlarges. This may occur to such an extent that the tricuspid valve becomes functionally incompetent, and its incompetence results in right auricular enlargement and systemic venous stasis. This may even reflect back to the left ventricle and result finally in enlargement of this chamber.

Various factors have hampered solution of the problem, even though the cause has been recognized and the effects clearly defined. Inadequate methods of anesthesia were a limiting factor in the success of early operative attempts. These have largely been eliminated. The original instruments were unsuitably designed. Many useful modifications are available at present (Figs. 1 and 2). No standard approach to the valve has been determined. In general, three approaches have been utilized at various times: left pulmonary vein, left ventricle, and left auricular appendage. Unquestionably the appendage appears best suited to the purpose, since it affords more working room, is more easily accessible without displacing the heart, eliminates entanglement in the cordae tendinae, affords easier palpation of the valve and provides an adequate biopsy specimen of cardiac muscle. In our opinion it should be ligated at its base in all cases, to eliminate the possibility of thrombus formation in its trabecular interstices.

More important than the foregoing considerations, however, was the acceptance of the concept that the solution necessitated merely enlargement of the orifice by whatever means were most convenient. This prevailed because of the erroneous belief that the resultant in-

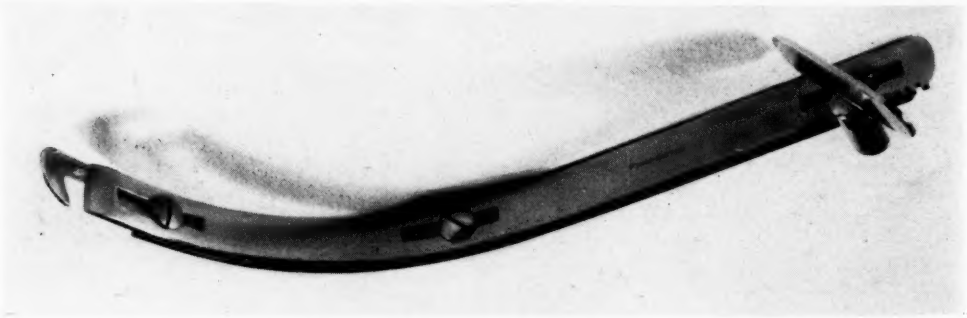

Fig. 2.—Instrument of recent design.

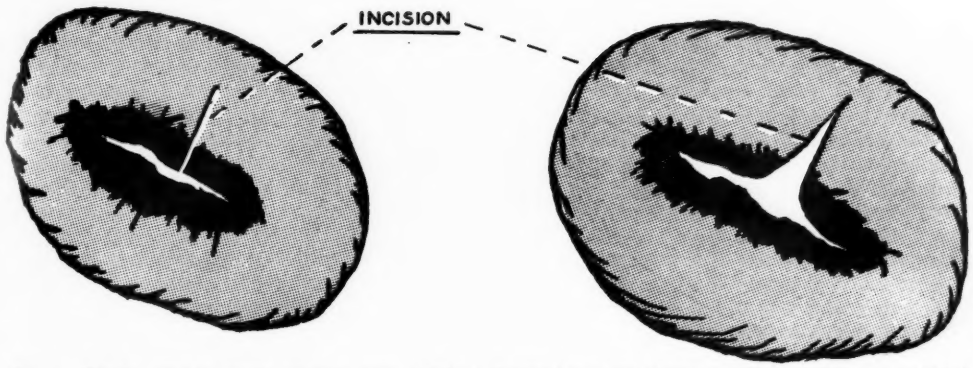


Fig. 3.—Simple incision across anterior cusp (Cutler). Separation of cut edges inevitably produces uncontrolled regurgitation through anterior leaflet.

crease in regurgitation would be of no significance. We, on the other hand, maintain that *any* increase in regurgitation is detrimental and is often directly responsible for the high mortality rate attendant upon such procedures.

Therefore, a number of surgical maneuvers have been proposed and carried out. They may be classified, with slight variations, as follows:[2]

1. *Simple incision of a valve cusp (Fig. 3).*—This has consistently met with failure. A meager incision leaves the valve unchanged. One that extends through the scarred tissue will result in fatal regurgitation, especially if it is made in the anteromedial or aortic cusp.

2. *Excision of a portion of the mitral ring (Fig. 4).*—This was practiced by those who believed that transforming a stenotic lesion to a regurgitant one afforded the only hope of alleviation. With this concept we are in complete disagreement. The total evidence at hand to date refutes this idea.

3. *Digital dilation of the stenotic orifice (Fig. 5).*—Souttar[3] first utilized this procedure in 1925 with success in 1 case. Using the same maneuver, we have had one success in three attempts. The limitations of this procedure are twofold: First, there is no assurance that the tear will occur at the proper place. The ring will rupture at its weakest point, and if this happens to be in one of the cusps a predominant regurgitant lesion will result. Second, should it tear at one of the commissures, the length of the openings may well be inadequate; in other words, it may not split all the

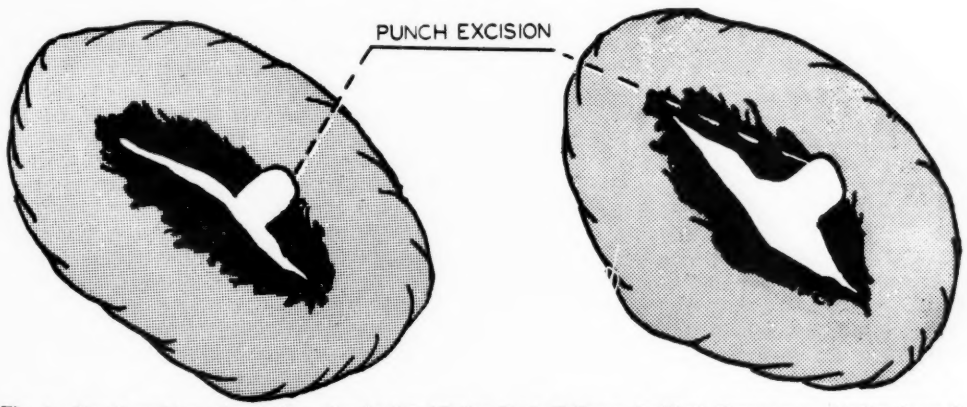


Fig. 4.—Punch excision of anterior valve leaflet (Cutler, Beck, Pribram, Smithy). Severe regurgitation through important anterior valve cusp is limited only by size of incisional defect.

way out to the flexible tissue and so is prone to fuse again.

4. *Valvuloplasty (Fig. 6).*—A procedure has been described by Harken by which portions of the stenotic valve ring are excised at the commissures. Production of limited or selective regurgitation is intended. Objections to this procedure might stem from the difficulties of adequate localization of the commissures solely by palpation with the valvulotome. It is also true that excision of the commissures would tend to produce more regurgitation than would incision.

5. *Commissurotomy (Fig. 7).*—This term was suggested to us by Dr. Thomas Durant of Philadelphia to designate the procedure we have employed in our endeavors to restore function to the mitral valve.[4] The operative technic has been simplified and lends itself to a definitive routine. The patient is anesthetized in the supine position. A submammary incision is made on the left and carried through the pectoralis muscle. Entrance is gained to the pleural space through the third rib bed. An incision is made in the mediastinal pleura and pericardium, anterior and parallel to the phrenic nerve. The distended auricular appendage now protrudes. A purse-string suture of heavy braided silk is placed about the base of the appendage but not made taut. A special clamp is closed on the base just distal to the purse string. The appendage is amputated just distal to the clamp. Now the special knife is inserted through this opening upon releasing the clamp. The knife is applied closely to the palmar surface of the index finger of the right hand by means of a second glove, which is fenestrated to allow protrusion of both the blade and the handle. Once the finger and the knife are in the left auricle, the purse string is temporarily tightened to prevent blood loss. A leisurely digital examination of the auricle is carried out, and the condition of the valve is determined. The direction of the commissures is located, and then the knife is applied to the anterolateral one and an incision is made out to the flexible area.

Marked rigidity of the valve at times necessitates cutting the posteromedial commissure. Should this be necessary, the finger is pronated and the proper incision is made in a similar manner. The knife is not withdrawn until digital examination is carried out again and the valve is noted to be satisfactorily functioning. Upon withdrawal of the finger and knife the purse string is tightly closed and securely ligated. This is reinforced by securely oversewing the cut edges with continuous arterial silk sutures. The pericardial incision is left open to drain into the pleural space so as to prevent tamponade. The pleural space is drained with a fenestrated catheter, and the thoracic wound is closed with interrupted cotton sutures.

In our more recent cases, manometer readings of pressures within the left auricle and the pulmonary artery were taken both before the valve was cut and after cutting. These have indicated an invariable lowering of the pressures.

## RESULTS

Commissurotomy has been carried out on 21 patients up to the time of writing. Five have died as a result of the operation, and 16 have made satisfactory recoveries. Three of the fatalities have occurred among the first 5 cases in which the operation was done. Death occurred as a result of technical errors which, by experience, are now known to be preventable. The other 2 deaths occurred among the last 16 cases. The cause in 1 case was undetermined, and the patient in the other case died of progression of his disease, having shown a relatively high degree of regurgitation. In retrospect, we feel that this patient should not have been considered for the operation.

Of the 16 survivors, 12 have made excellent recoveries from their stenosis as judged by clinical and physiologic determinations; 3 have improved considerably, and 1 was operated on too recently to justify appraisal, aside from the observation that the postoperative course has been uncomplicated.

## SUMMARY

Mitral stenosis and its treatment by commissurotomy are discussed in the light of the authors' personal experience. The physiologic changes associated with this disease are traced, certain therapeutic problems and handicaps pointed out, and a number of surgical approaches described. The authors favor commissurotomy, the technic of which they pre-

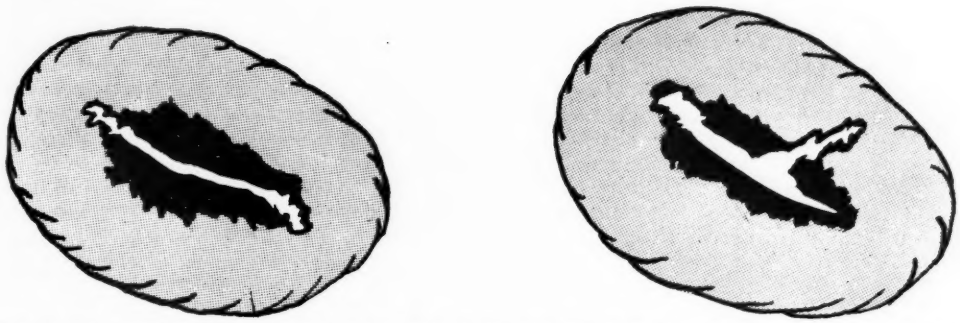

Fig. 5.—*Left*, tearing of commissures by simple dilatation (Souffar, Bailey, Brock). There is some restoration of valvular function. *Right*, inadvertent tearing of anterior valve leaflet during dilation, leading to fatal regurgitation.

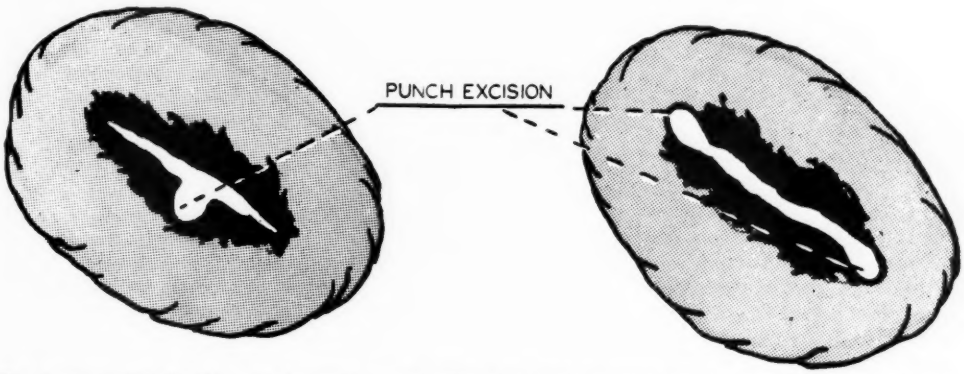


Fig. 6.—*Left*, "limited" or "selective" regurgitation (Harken) in punch excision of posterior valve leaflet. *Right*, "valvuloplasty" (Harken), with punch excision of valve tissue at commissures. Like commissurotomy, this can reestablish valvular function.

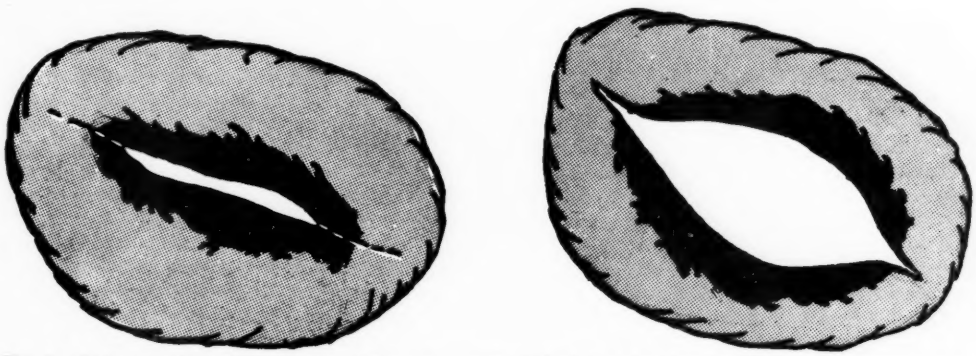

Fig. 7.—*Left*, commissurotomy by direct finger approach ("digital vision"). *No additional regurgitation is produced. Right*, wide opening of a valve during ventricular diastole (0.7 of cardiac cycle). Because the valve is normally open, the cut edges are kept apart and do not tend to heal (dog, twelve months; man, two and one-half months).

sent in detail. Of 21 patients subjected to this operation, 16 made satisfactory recoveries. Most of the fatalities took place in the developmental stage of the operative technic and are attributed to technical imperfections and erroneous selection of patients. The authors express the opinon that the procedure as now performed is to be strongly recommended.

RÉSUMÉ

On discute la sténose mitrale et son traitement par commissurotomie à la faveur de l'expérience personnelle des auteurs. On décrit les changements physiologiques qui accompagnent cette maladie; on insiste sur certains problèmes thérapeutiques et certaines difficultés, et on décrit quelques possibilités de voie d'abord chirurgicale. Les auteurs sont en faveur de la commissurotomie, dont ils présentent, en détail, la technique.

Sur 21 malades ayant subi cette opération, 16 ont eu un résultat satisfaisant. La plupart des exitus survinrent à l'époque où la technique opératoire était en voie d'améliorations et sont attribués à des imperfections de technique et à une insuffisante sélection de malades. L'opinion des auteurs est que le procédé, ainsi mis au point maintenant, doit être fortement recommandé.

RESUMEN

Basándose en su experiencia los autores estudian la estenosis mitral y su tratamiento por la comisurotomía. Exponen también los autores las alteraciones fisiológicas asociadas a esta enfermedad y los problemas terapéuticos y desventajas relacionados con la misma, presentando con todo detalle la técnica de la comisurotomía, que los autores consideran como la intervención más recomendable.

De los 21 pacientes sometidos a esta intervención, 16 se restablecieron satisfactoriamente. La mayor parte de los accidentes mortales acaecieron durante la fase de desarrollo de la técnica operatoria, atribuyéndose a imperfecciones técnicas y a una selección errónea de los pacientes. Los autores opinan que ya puede recomendarse encarecidamente la técnica descrita, tal y como se practica en la actualidad.

RIASSUNTO

Discute la fisio-patologia e la cura della stenosi mitralica, giungendo alla conclusione che la commissurotomia rappresenta il procedimento chirurgico migliore.

Sopra 21 pazienti operati con la tecnica descritta dall'A. 18 sono guariti. La maggioranza degli esiti letali sono stati lamentati durante lo sviluppo della tecnica operatoria: sono quindi attribuibili o ad imperfezioni tecniche, o ad una scelta non appropriata dei pazienti.

Questo nuovo procedimento operatorio e' quindi vivamente raccomandato dall'A.

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# Tuberculosis of the Greater Trochanter and Its Bursa
## Treatment with Streptomycin and Surgery

NELSON C. JEFFERSON, M.D., A.I.C.S., JOHN M. PALMER, M.D., AND CLYDE W. PHILLIPS, M.D.
CHICAGO

TUBERCULOSIS, either primary in the lungs or in any one of its secondary manifestations elsewhere in the body, still offers a challenge to human endeavor. In spite of all present-day efforts to achieve early diagnosis and effective treatment, the disease remains a therapeutic problem. The fact that promin and, more recently, streptomycin along with standard or acceptable methods of treatment are beneficial in tuberculosis needs only to be mentioned.

Tuberculosis of the greater trochanter and its bursa, as an entity, is not frequently seen. The clinical as well as the roentgen diagnosis is often missed. Recurrence after acceptable methods of treatment is common. However, results obtained after total excision of the disease process combined with streptomycin therapy cannot be found in the literature. There is likewise no appreciable literature on the effects of streptomycin therapy in bone and joint lesions when used both locally and intramuscularly with surgery. Perhaps this is because of the infrequency of identical or similar bone lesions and the fact that the time required in follow-up observations of these cases is of necessity prolonged. It is for this reason that our two cases so treated were thought to merit attention.

Historically, in 1870 Teale,[1] an English writer, made reference to the entity but not to its cause. Hall[2] reported 4 cases of tuberculous trochanteric disease in 1900. Weiting[3] is credited with having first described the entity in 1904. Thurston[4] described bilateral tuberculous bursitis of the hip with excision and good results in 1907. Cone[5] in 1911 and Swindt[6] in 1921 stressed trauma as an etiologic factor. Clopton[7] in 1919 and Keith[8] in 1922 attempted an explanation for tuberculosis of the trochanter as having a predilection for its origin in bone rather than the soft tissue bursa, the greater trochanter having developed from an epiphysis. (No explanation on this controversy is contemplated by us.)

Although the disease is said to be rare in children, Perrin[9] reported a case of its occurrence in a 3½-year-old boy. Hauser[10] reported the case of a 5-year-old child and Cholmeley[11] that of an infant 9 months of age. Although the condition is most frequently seen in adults, no age group is immune to tuberculous osteomyelitis of the greater trochanter.

Meyerding and Mroz[12] made an extensive study of this condition and reported 19 cases of their own, in 14 of which the right side was involved. Tuberculosis was present elsewhere in the body in 73 per cent. In 1940 Wassersug[13] stated that about 75 cases had been reported in the literature. Of the patients in his series, 13 were male and 5 were female. In 13 the left side was involved. Seventy-two per cent had tuberculosis elsewhere in the body. Stuck and Hinchey[14] and others have stressed the importance of complete excision of the diseased process. Rest of the part, together with wholesome nutrition, were the only adjuncts of proved supportive value at that time. Donovan

Fig. 1 (Case 1).—A large depressed scar with a draining sinus is seen on the lateral aspect of the right thigh.

From the Department of Surgery, Provident Hospital, Chicago.

Fig. 2 (Case 1).—Tuberculous osteomyelitis of the right greater trochanter with sinus extension to skin.

and Sosman[15] urged keen clinical and roentgen acuity in order to diagnose calcium flecks in the bursa; this phenomenon is roentgen evidence of tuberculous bursitis. They emphasized the necessity for prolonged immobilization in a plaster cast; this view, however, was challenged by Wassersug[13] who stated that such immobilization is not necessary. Briede[16] elaborated on the condition from the standpoint of roentgen diagnosis, pointing out that a ragged edge of the greater trochanter with caseation or calcium deposits in the bursa is pathognomonic.

Judging from the foregoing references in the literature, tuberculosis of the greater trochanter is not common. A fairly exhaustive search has revealed only 12 case reports since Wassersug in 1940 referred to 75 cases up to his time, excluding his own 18. This makes a grand total of 105[4] confirmed cases[1] reported, including our own. The fact that we have had the opportunity to treat two such cases with local and intramuscular streptomycin combined with surgical excision was thought to be of interest and aroused our desire to review the literature on this subject.

## REPORT OF CASES

Case 1.—D. S., a man aged 46, entered Provident Hospital July 31, 1947. His chief complaint was of a draining sinus in the region of the right hip, of three months' duration. His clinical history dated back forty-one years, to a time when, at the age of five years, he fell on the right hip and this injury was followed by a purulent drainage from that area. The superficial tissues eventually healed. In 1927 the scar area broke down and again drained purulent material. Incision and drainage were instituted in Iowa. Eventual healing of the soft tissues followed. In 1944 another abscess formed. This time incision and drainage were done in California, with soft tissue healing after two months. His present illness which began in May 1947 brought him to us in July of the same year. Physical examination revealed a draining sinus over the right hip, from which could be expressed pus and a watery material. A large depressed scar presented on the lateral aspect of the thigh (Fig. 1). There was no unusual pain on weight bearing, little tenderness and no heat. A slight limp with no apparent limitation of motion was observed. No other contributory factors were noted. Our impression was that of chronic nonspecific osteomyelitis of the femur. Radiopaque mediums were instilled into the sinus tract and roentgenograms were taken. These revealed osteomyelitis of the greater trochanter with sinus extension to the skin (Fig. 2).

On August 5, with the patient under general anesthesia, the sinus tract was injected with methylene blue and the complete process excised, including the greater trochanter. The wound was irrigated with warm physiologic solution of sodium chloride and packed with 4 Gm. of sulfathiazole powder together with iodoform gauze. The latter was removed after two weeks. Plastic repair was

Fig. 3 (Case 1).—Plastic reconstruction of the right thigh.

done on the scar area at the time of operation (Fig. 3). Penicillin (1,000,000 units) was given postoperatively in doses of 50,000 units every three hours intramuscularly, and 2 Gm. of streptomycin were given daily in doses of 0.5 Gm. every four hours for three days. Ambulation was started on the fourth postoperative day. The patient was discharged on August 21, sixteen days after the operation, without complaint. Evidence of complete superficial healing, without drainage, was apparent in three weeks.

The microscopic diagnosis was tuberculous osteomyelitis of the right greater trochanter and its bursa, unsuspected at the time of operation. The thoracic roentgenogram showed no evidence of active tuberculosis in the pulmonary areas (Fig. 4). Roentgen control study on April 7, 1948, showed no evidence of further destruction of the femur or involvement of the joint (Fig. 5). The patient is now working and gaining weight, with no symptom of recurrence.

CASE 2.—P. D., a woman aged 38, was admitted to Provident Hospital Feb. 2, 1948. The chief complaint was of a cold abscess in the right hip, of six months' duration. There was a slight limp with no limitation of motion and no pain on weight bearing. The patient had been tuberculous since 1943 and had undergone collapse therapy for five years in another institution. Although there had been several bouts of hemoptysis, tests of the sputum gave negative results. Her husband had recently died of pulmonary tuberculosis. A clinical diagnosis of tuberculosis of the greater trochanter and its bursa was made and confirmed by roentgenogram (Fig. 6). The thoracic roentgen film showed pneumothorax on the right side (Fig. 7). There was no appreciable loss of weight. All other findings were essentially negative and noncontributory.

Streptomycin was administered, beginning on February 21. One-half Gm. was given intramuscularly every four hours in four doses daily. On February 24, with spinal anesthesia, the abscess

Fig. 5 (Case 1).—Approximately eight months after operation. No further destruction is noted.

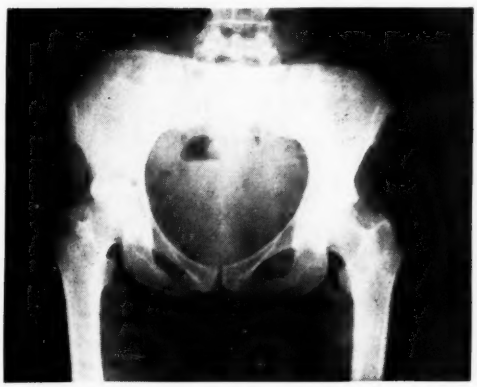

Fig. 6 (Case 2).—Moth-eaten defect in the right greater trochanter and calcium flecks in the bursa are seen.

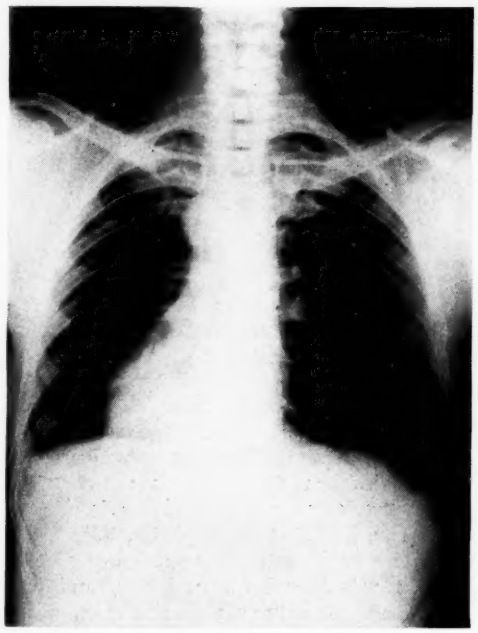

Fig. 4 (Case 1).—Chest reveals no evidence of tuberculosis.

was injected with methylene blue and the entire process excised, including a saucerization of the affected trochanter. The wound was irrigated with warm saline solution, after which the defect was packed with 4 Gm. of sulfathiazole and 2 Gm. of streptomycin, and an iodoform gauze packing was left in place for two weeks. Ambulation was started on the first postoperative day Streptomycin in doses of 0.5 Gm. was given every four hours postoperatively until the patient's discharge from the hospital on March 7, twelve days after the operation.

The soft tissues healed one week after the packing was removed. Postoperative roentgen control study on April 13 showed absence of the soft tissue caseation and clean saucerization of the bony defect (Fig. 8). At the time of writing, although the patient still has a slight limp, there is no other complaint referable to this condition. The microscopic diagnosis confirmed the clinical impression: tuberculous osteomyelitis of the greater trochanter and its bursa.

## COMMENT

So far as we can determine, no rational approach to the management of trochanteric tuberculosis appears in the literature, although the fact that streptomycin is a helpful adjunct in treatment of tuberculosis is now well known.[17] When lesions are accessible such as those of the trachea and bronchi[18] the effect of this agent appears to be specific and completely curative after topical use supplemented by intramuscular injections. It is emphasized that for effective results the concentration of the drug in its initial dose must be adequate, otherwise streptomycin resistance will appear before expected results are obtained. This was observed in 6 of 12 cases reported by Madigan and his associates.[17c]

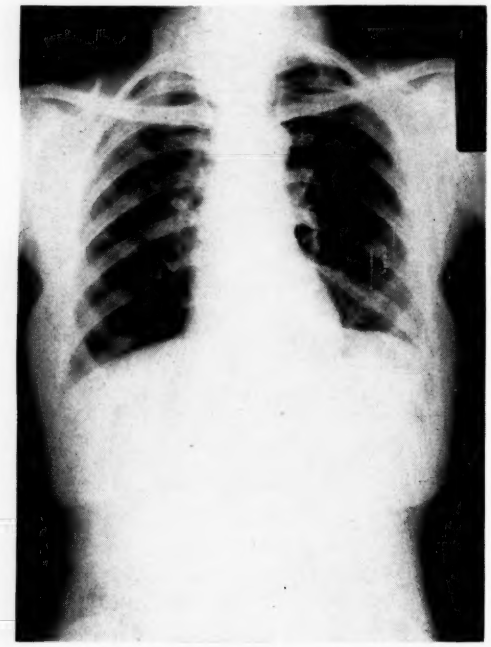

Fig. 7 (Case 2).—A pneumothorax is present on the right side.

Willis[19] has stressed the lack of knowledge concerning the effect of streptomycin in tuberculous lesions other than pulmonary and has urged diligent observations on other such foci.

Although some of the older reports stressed long-term immobilization in plaster, this does not now appear necessary, since the process in a sense does not involve a movable surface. Further, complete excision of the pathologic process can be done with little or no danger of a pathologic fracture, unless of course the disease has extended well into the neck of the femur. No apparent disability follows removal of the greater trochanter. These patients are known to have a limp before operation and it may continue unabated after operation. The number of bursas involved does not seem to be an important factor. Spalteholz describes sixteen bursas about the hip joint; other writers have described as many as thirty-one; only three appear to be of importance, namely: (1) the gluteus maximus bursa, over the greater trochanter; (2) the ileopectineal and (3) the ischiogluteal (Meyerding[12]).

Our routine of management, consisting of complete excision of all diseased tissue, thorough irrigation of the defect with warm saline solution, physiologic solution of sodium chloride, and the local implantation of streptomycin in order to insure a high concentration of the drug is similar to that of Steeken et al.,[20] who found that after intramuscular injections of streptomycin 1.8 to 2 Gm. daily, tuberculous cavities contained a higher concentration of the drug than did other tissues, and high enough to inhibit the growth of the organisms in vitro. We used intramuscular injections to support and buffer the local implantations.

Further support to this rationale is an observation by Jefferson,[21] who followed this procedure in treating a tuberculous lesion of the distal portion of the ulna, including the epiphysis. There was roentgen evidence of complete arrest of the process, with restoration of function of the wrist joint after six months. However, because of the proximity of the joint a posterior molded plaster cast was worn during the six-month period.

Fig. 8 (Case 2).—Appearance of right greater trochanter approximately two months after saucerization.

## SUMMARY

Two cases of tuberculous osteomyelitis of the greater trochanter and its bursas are presented, together with a discussion of treatment and of early and intermediate postoperative results.

An arbitrary routine procedure was followed by us as a result of our own observations and such observations and information as we could obtain from others in similar or comparable circumstances.

In our 2 cases the right side was involved. Both patients were adults, one a man with a history of trauma in early childhood but no evidence of clinical tuberculosis elsewhere, and the other a woman with an active pulmonary lesion.

In our opinion, total excision of the lesion, thorough irrigation of the defect with warm saline solution, and implantation of at least 2 Gm. of streptomycin locally, supplemented with 0.5 Gm. of streptomycin intramuscularly every four hours in four doses daily for at least two weeks, is a reasonable and rational approach to the treatment. Immobilization by means of a plaster cast does not appear to be necessary.

Except for some transient vertigo, no untoward affects referable to the streptomycin therapy were observed by us.

## RÉSUMÉ

On présente deux cas d'ostéomyélite tuberculeuse du grand trochanter et de ses bourses, et on discute du traitement et des résultats post-opératoires immédiats et secondaires. Selon les propres observations des auteurs et d'après les observations et les informations qu'ils avaient pu obtenir d'autres auteurs dans de semblables et comparables circonstances, un procédé précis était employé.

Dans les deux cas présentés, le côté droit était atteint. Les deux malades étaient adultes, l'un, un homme, présentant une histoire de traumatisme dès la première enfance, mais nulle part une évidence de tuberculose clinique, et l'autre, une femme avec une lésion pulmonaire en activité.

L'excision totale de la lésion, l'irrigation complète de la lésion avec une solution salée chaude, et la mise-en-place de, au moins, 2 gr. de streptomycine localement, à laquelle on ajoute 0.5 gr. de streptomycine intramusculaire chaque quatre heures, quatre fois par jour, durant au moins deux semaines, tous cela d'après l'opinion des auteurs, constitue un traitement s'approchant rationnellement d'une méthode thérapeutique. L'immobilisation par un appareil plâtré ne semble pas nécessaire. A l'exception de quelques vertiges transitoires, on n'observa aucun effet fâcheux causé par l'emploi de la streptomycine.

## RESUMEN

Se estudian dos casos de osteomielitis tuberculosa del trocánter mayor y sus bolsas articulares analizándose su tratamiento y los resultados postoperatorios inmediatos y ulteriores.

Se eligió un procedimiento operatorio como resultado de las observaciones de los autores,

y de los datos e información que recopilaron de otros autores en casos similares o comparables.

En los dos casos presentados la localización era en el lado derecho. Ambos pacientes eran adultos y uno de ellos, del sexo masculino, presentaba una historia de traumatismo en su primeria infancia sin tener signos de tuberculosis en ningún otro lugar del organismo; siendo el otro paciente del sexo femenino, y teniendo otra lesión tuberculosa.

A juicio de los autores, la terapia más apropiada es la extirpación total de la lesión, la irrigación de la misma con solución salina caliente y la aplicación local de 2 gm. de estreptomicina como mínimo, complementada por dosis de 0,5 gm. de estreptomicina por vía intramuscular cada 4 horas, representando un total de cuatro dosis diarias por lo menos durante dos semanas. Al parecer no es necesaria la inmovilización mediante vendajes escayolados. A excepción hecha de una reacción transitoria de vértigo, no se han observado reacciones secundarias atribuibles a la estreptomicinoterapia.

RIASSUNTO

Descrive due casi di osteomielite tubercolare del grande trocantere e delle sue borse. Discute la cura e riporta i risultati a distanza. In ambedue i casi la lesione interessava il trocantere destro. Nel primo caso si trattava di un uomo adulto, senza altre lesioni tubercolari, nella cui anamnesi figurava un trauma nella prima infanzia. Nel secondo caso esistevano invece delle lesioni polmonari ancora attive. La cura e' consistita nell'escisione completa delle partiamalate; in un'irrigazione de difetto residuante con soluzione fisiologica calda; nell'impianto locale di 2 gr. di streptomicina, associato ad iniezioni di 0,5 gr. di streptomicina ogni quattro ore, per almeno due settimane. Non ritiene invece necessaria l'ingessatura dell'arto. L'unico piccolo inconveniente della streptomicina consiste in un transitorio senso di vertigine.

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# An Observation in Cancer Research

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DOES the cause of cancer reside in the red blood corpuscles?

In the February 1948 issue of *Experimental Medicine and Surgery* appears an article by Dr. G. Meirowsky, "The Experimental Production of Epithelial Growth in the Rabbit Cornea." The author announces this conclusion: "We believe the *blood* of patients suffering from advanced cancer contains either an animate or inanimate stimulus which causes the epithelial cells of the cornea to grow in an uncontrolled manner." As I hold a like opinion, I wish to present the observations on which my belief is based.

Reference to laboratory notes shows that in 1938 I first mentioned *queer-looking bodies* seen in or on the red blood corpuscles of the *live* blood of cancer patients. These were seen through the darkfield condenser of a high-powered microscope, and at first little attention was paid to them, as they were then regarded as ordinary crenations of the red blood cells. Because of recent improvements in the lighting of darkfield it is now possible to discern these bodies far more clearly, as the accompanying photomicrographs make plain.

These photographs, the work of the well-known microphotographer Mr. Julius Weber of New York, were taken with the new Zirconare lamp, containing a 100-watt bulb with an initial magnification of 1,350. They were later enlarged five times. They were made from slides prepared by making a smear from a freshly removed *unfixed*, malignant human breast cancer.* Such a preparation is usually made in the operating room, a piece of cancerous tissue being taken from the inside of the breast immediately after the breast's removal. The slide is then fixed in methyl alcohol and stained for five minutes with a Giemsa stain to which a small quantity of eosin has been added to bring out the erythrocytes. The slide is then washed in distilled water and dried by blotting—not by heat. By examination with Shillaber's immersion oil and highest power objective—we use 15X oculars—these bodies are clearly seen. Their shadows may be discerned in the darkfield, as shown by the two erythrocytes in Figure 1, and when the shutter of the darkfield condenser is shifted to admit the white light these bodies in or on the same two red blood corpuscles become even more distinct (Fig. 2).

This observation has now been confirmed in studies of other breast cancers (Figs. 3, 4, 5 and 6) and it is reported here in order that others may know of it. The bodies have not yet been definitely classified.

*Thanks are due to Dr. Frank E. Adair, Breast Surgeon, Memorial Hospital, New York City, for furnishing material to make this study.

### LA CAUSE DU CANCER RÉSIDE-T-ELLE DANS LES GLOBULES ROUGES?

Dans l'édition de février 1948 *de Médecine et Chirurgie Expérimentale* a paru un article du Dr. G. Meirowsky sur "La Production Expérimentale d'une Tumeur Epithéliale de la Cornée du Lapin." L'auteur fit la conclusion suivante: "Nous croyons que le sang des malades atteints d'un cancer avancé, contient un principe actif, soit animé ou inanimé, qui est la cause de la croissance des cellules épithéliales de la cornée d'une façon désordonnée." Comme je suis du même avis, j'ai décidé de présenter les observations sur lesquelles est basée mon opinion.

En se rapportant aux notes de laboratoire, on voit qu'en 1938 j'ai le premier fait mention de *corpuscules d'aspect inusités* dans ou sur les globules rouges du sang vivant des malades cancéreux. Ils furent aperçus à travers le condensateur du champ obscur d'un microscope à grande puissance et au début on fit trés peu attention à eux du fait qu'ils étaient alors considérés comme des irrégularités des globules rouges du sang. A la faveur de récents progrès dans l'éclairage du champ obscur il est maintenant possible de distinguer des corpuscules beaucoup plus clairement, comme le montrent les microphotographies ci-jointes.

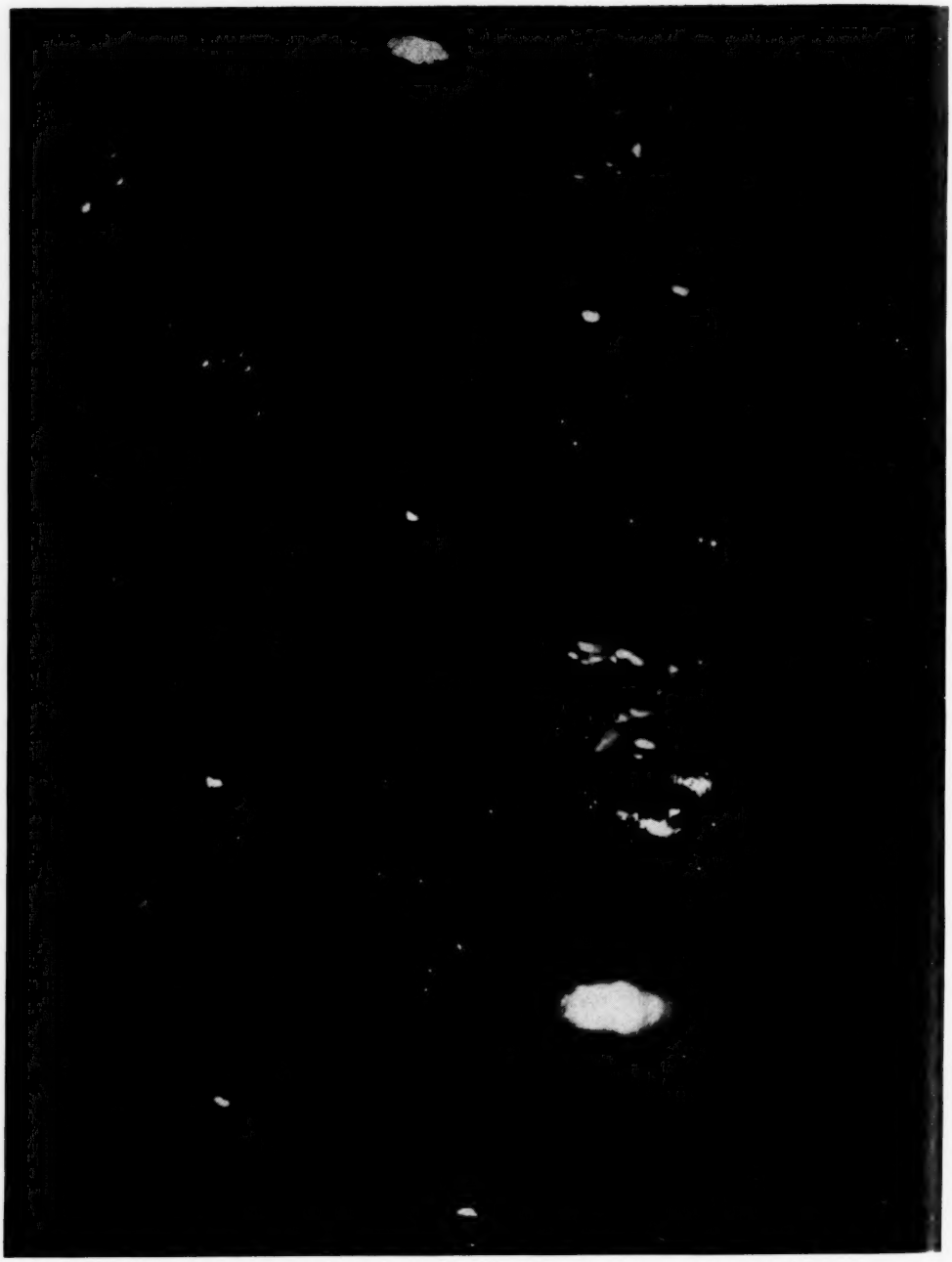

Fig. 1.—Darkfield photomicrograph showing two red corpuscles beside the large artifact. Made from a smear of a freshly removed *unfixed* malignant tumor (cancer) of the human breast. Giemsa stain.

Fig. 2.—Same two erythrocytes photographed with the white light of the Zirconarc lamp.

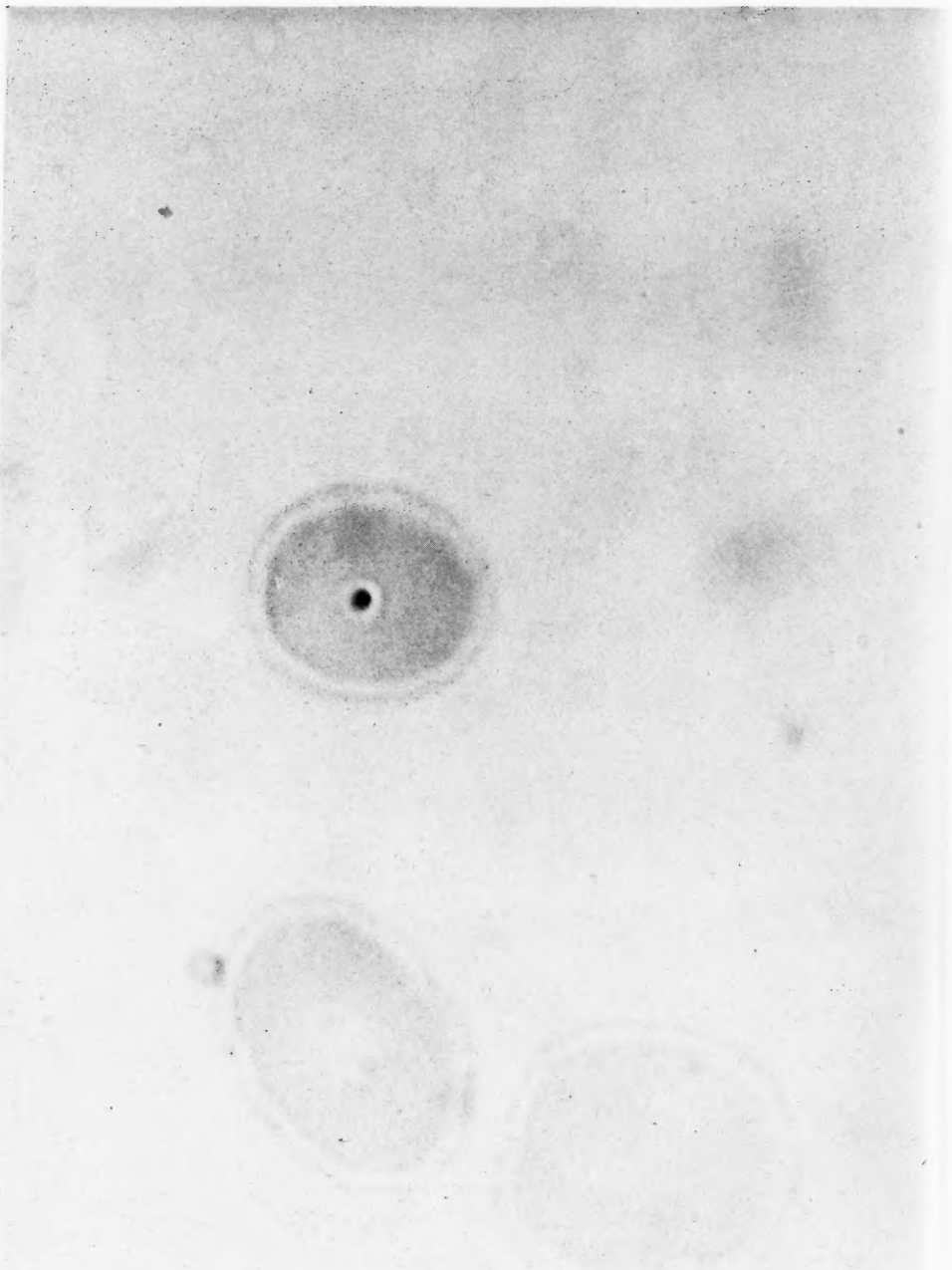

Fig. 3.—Single unexplained body in a red corpuscle. Note the halo around it. Note also that the operator has the body in perfect focus. (Taken in another case).

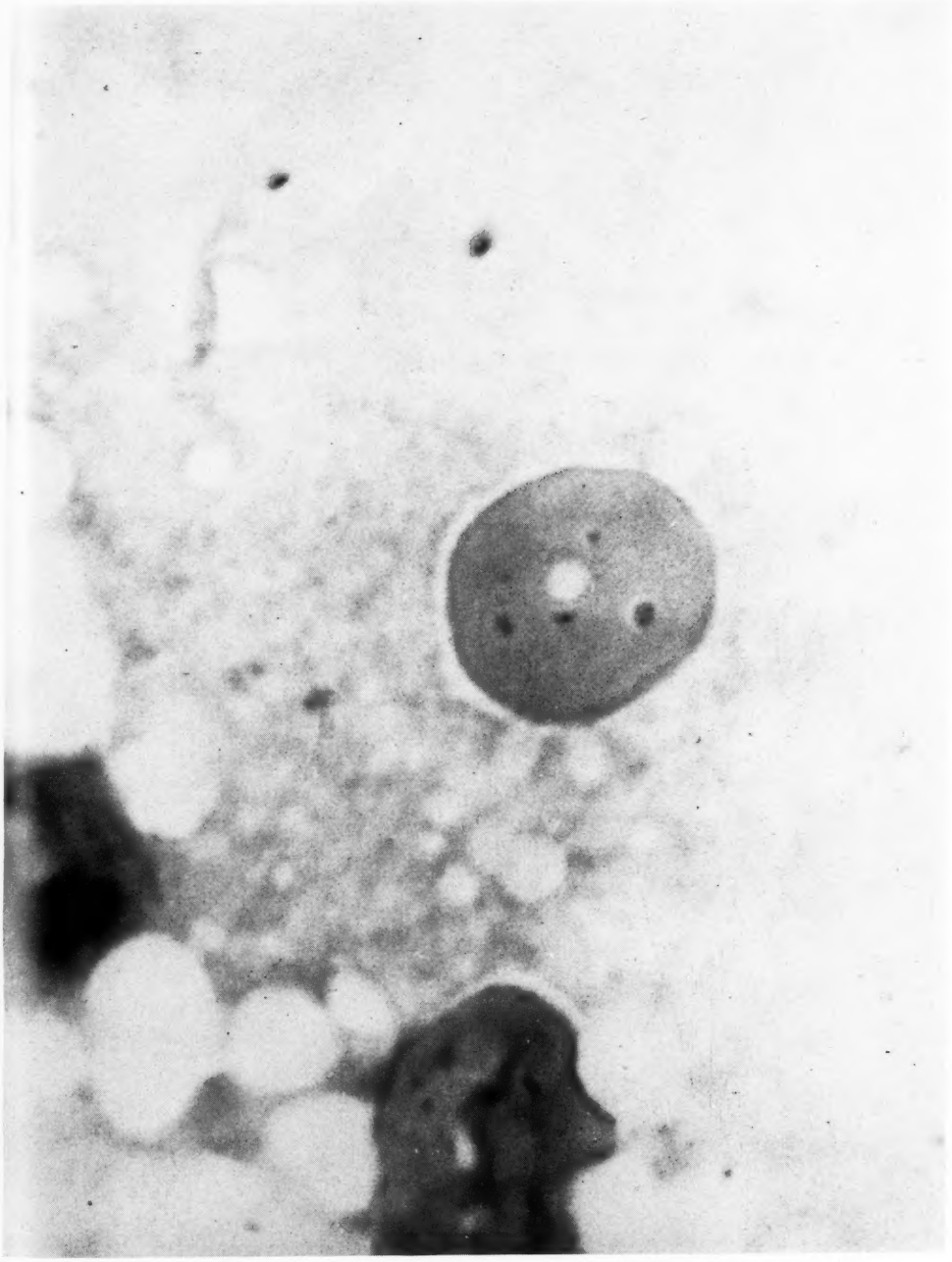

Fig. 4.—Five bodies clearly shown in another red blood cell.

Fig. 5.—Many red blood cells, some showing bodies. (From another case.)

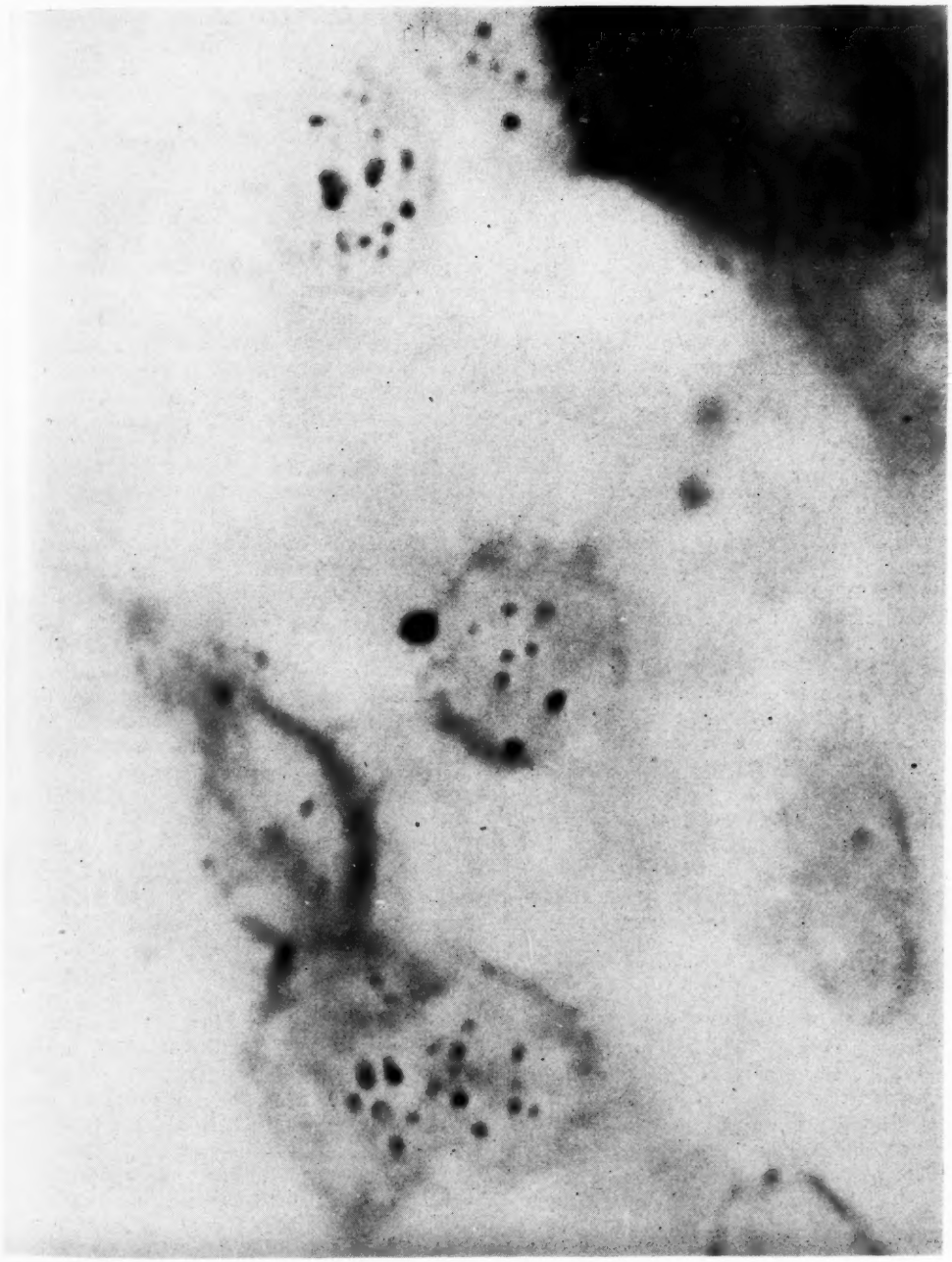

Fig. 6.—Many bodies are visible in cases of advanced carcinoma. Note the large nucleus of a cancer cell at lower right.

Les photographies, travail d'un microphotographe bien connu, M. Julius Weber de New York, furent prises avec la nouvelle lampe Zirconard, contenant une ampoule de 100-watt avec un agrandissement initial de 1,350. Elles furent plus tard agrandies cinq fois. Elles furent faites avec des lames préparées en faisant un étalement d'un peu de sang humain, fraîchement prélevé de cancéreux atteint d'une tumeur maligne en évolution. Une telle préparation est actuellement faite dans la salle d'opération. La pièce du tissu cancéreux étant prise à l'intérieur du sein immédiatement après son ablation. La lame est alors fixée par l'alcool métylique et colorée pendant cinq minutes avec le colorant de Giemsa auquel une petite quantité d'éosine a été ajoutée pour faire apparaître les érythrocytes. Le lame est alors lavée dans d'eau distillée et sèchée au buvard, non à la chaleur. En examinant avec l'immersion dans d'huile de Sillaber et un objectif à très grande puissance—nous employons les oculaires 15X—ces corpuscules sont clairement aperçus. Leurs ombres peuvent être discernées dans le champ obscur, comme cela est montré par les deux érythrocytes dans la figure 1, et lorsque la fermeture du condensateur du champ obscur est déplacée pour permettre l'admission de la lumière blanche, ces corpuscules dans ou sur ces mêmes deux globules rouges deviennent plus distincts (fig. 2).

Cette observation a été confirmée par l'étude d'autres cancers du sein (fig. 3, 4, 5, & 6) et elle est rapportée ici pour que d'autres puissent la connaître. Ces corpuscules n'ont pas encore été définitivement classifiés.

### ¿RADICA EN LOS HEMATÍES LA CAUSA DEL CÁNCER?

En el número de Febrero de 1948 de la revista *Experimental Medicine and Surgery* se publicó un artículo del Dr. G. Meirowsky, titulado "The Experimental Production of Epithelial Growth in the Rabbit Cornea" ("La producción experimental de un tumor epitelial en la córnea del conejo"). El autor llegó a la siguiente conclusión: "Creemos que la sangre de los pacientes que sufren de un tipo avanzado de cáncer, contiene un estímulo animado o inanimado que es la causa de que las células epiteliales de la córnea se desarrollen de un modo incontenible." A este respecto, deseo presentar las observaciones personales por las que yo tengo la misma opinión.

Consultando ciertas notas de laboratorio se comprueba que en 1938 mencioné por vez primera unos cuerpos de apariencia extraña que se observaban dentro o sobre los hematíes de la sangre viva de los pacientes de cáncer. Estos cuerpos se observaban usando un condensador en campo oscuro de un microscopio de alta potencia, y en un comienzo se les prestó poca atención ya que se les consideraba como concreciones ordinarias de las células rojas de la sangre. Los recientes adelantos en la iluminación en campo oscuro han permitido observar estos cuerpos más ampliamente como lo demuestran las fotomicrografías acompañantes.

Las fotografías adjuntas que fueron tomadas por el conocido microfotógrafo Julius Weber de Nueva York se obtuvieron con la nueva lámpara Zirconarc que contiene una bombilla de 100 vatios y posee un aumento inicial de 1.350 diámetros. Las fotografías se ampliaron posteriormente a cinco veces su tamaño original. Fueron tomadas de láminas preparadas haciendo un frotis de un cáncer de mama maligno no fijado, humano. Dicha preparación se hace habitualmente en el quirófano, tomando un fragmento del tejido canceroso del interior de la mama, inmediatamente después de extirpar la misma. La preparación se fija con alcohol metílico y se tiñe durante cinco minutos con el colorante de Giemsa al que se le ha agregado una pequeña cantidad de eosina para hacer visibles los eritrocitos. Se lava entonces la lámina en agua destilada y se seca, no por el calor, sino con un secante. Al examinarla usando el método de Sillaber de inmersión en aceite y un objetivo de la más alta potencia -nosotros empleamos oculares x 15 - se observan claramente estos cuerpos. Las sombras de los mismos pueden observarse en el campo oscuro como se observa en los dos eritrocitos de la figura 1. Cuando el diafragma del condensador en campo oscuro se mueve para dar entrada a la luz blanca se aprecian más distintamente estos cuerpos situados dentro o sobre los mismos dos hematíes (figura 2).

Estas observaciones se han confirmado por los estudios realizados en otros cánceres de

mama (figuras 3, 4, 5 y 6) presentándose en esta comunicación para que la conozcan otros investigadores. Los cuerpos citados no se han clasificado todavía de un modo definido.

## RISIEDE LA CAUSA DEL CANCRO NEI GLOBULI ROSSI DEL SANGUE?

Nel numero di febbraio 1948 dell' *Experimental Medicine and Surgery* e' apparso un articolo del Dr. G. Meirowsky del titolo: "Produzione sperimentale di proliferazioni epiteliali nella cornea del coniglio." Meirowsky giunge alle seguenti conclusioni: "Riteniamo che nelle fasi avanzate del cancro il *sangue* dei pazienti contenga uno stimolo animato o inanimato capace di determinare una proliferazione illimitara delle cellule epiteliali dello cornea." Quest'opiniane e' esatta: ed ora dimostrero' il perche' di questa mia convinzione.

In note di laboratorio datanti dal 1938, io vidi nell'interno o al disopra dei globuli rossi del sangue fresco di pazienti affetti da cancro dei strani corpuscoli. Questi erano visibili nel campo oscuro di un potente microscopio. In quell'epoca attribuii scarsa importanza a questi corpuscoli: essi erano allora considerati quali comuni incrinature dei globuli rossi. In base a recenti progressi nell'illuminazione del campo oscuro, questi corpuscoli possono essere ora visti molto piu' chiaramente, come risulta dalle seguenti microfotografie. Queste fotografie, opera del noto fotografo Juilius Weber di New York, sono state eseguite con la nuova lampada Zirconarc con un bulbo 100 Watt, con un ingrandimento iniziale di 1350. Sono state successivamente ingrandite 5 volte. I preparati sono stati ottenuti da strisci di carcinoma della mammella appena asportato e non fissato. Questo procedimento viene per lo piu' seguito nella stessa sala operatoria. Gli strisci vengono fissati in alcool metilico e colorati per 5' con Giemsa, al quale viene aggiunta una una piscola quantita' di eosina onde porre meglio in rilievo gli eritrociti. Gli strisci vengono poilavati con acqua distillata ed asciugati con carta assorbente, non con calore.

Con un potente microscopio ad immersions (oculare x 15) questi corpuscoli possono essere visti bene e facilmente. Le loro ombre sono chiaramente identificabili nel campo oscuro (nella fig. 1 sono contenuti in due eritrociti): allorquando il diaframma del condensatore viene spostato in modo da amettere nel campo amche la luce bianca, il loro aspetto diventa ancora piu' distinto (fig. 2). Osservazioni analoghe sono state eseguite in altri carcinomi della mammella (fig. 3-4-5-6).

I corpuscoli non sono stati finora definitivamente classificati. Abbiamo creduto opportuno di ritornare sull'argomento onde informare altri ricercatori di queste osservazioni.

# Retroperitoneal Lymphosarcoma Complicating Pregnancy

## Report of a Case

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AN INTERESTING case of retroperitoneal lymphosarcoma complicating pregnancy has recently been observed. The special interest lies in the fact that the patient carried her pregnancy to term and was delivered spontaneously even though the malignant tumor involved had progressed to the extent of metastases and to a weight of 8 pounds (3,629 Gm.). A brief review of the literature concerning lymphosarcoma will be presented, with special reference to lymphosarcoma of the retroperitoneal type.

### HISTORICAL NOTES

Lymphosarcoma was formerly included in the concept of pseudoleukemia. It was only through the work of Kundrat and Paltauf that it finally received recognition as an entity. It was Kundrat[1] who first recognized a notable gross and microscopic distinction between this process and the other aleukemic lymphomas. It is probable that Billroth had noted some difference, for he classified such tumors as "malignant lymphomas," describing them as locally destructive and recurring tumors of lymph nodes, but he could not separate the different types of these processes.[2]

Kundrat finally described lymphosarcoma as a tumor arising only from groups of lymph nodes, not from single nodes, and from adenoid tissue of mucous membrane, from which point he described it as extending to the neighboring nodes and the surrounding tissue. He noted that the systemic character of leukemia and pseudoleukemia was missing, and that the spleen, bone marrow and liver were rarely involved. His first classification of this tumor was that of "lymphosarcomatosis," and it is from his original study that today we know this tumor as lymphosarcoma.[3]

From the Department of Surgery, Margaretville Hospital.

### DEFINITION

Lymphosarcoma is a malignant tumor arising in lymphatic tissue, usually from a group of nodes or from a localized tract of mucosal lymphoid tissue, or occasionally from a single lymph node.[4]

### PATHOLOGIC PICTURE

*Morbid anatomy:* The enlarged lymph nodes are at first isolated, but soon they become matted together, and the malignant cells invade the capsule with resultant destruction. Kundrat recognized the regional character of the growth. Ewing[5] defined lymphosarcoma as a "true malignant neoplasm arising in the lymphatic tissue from a proliferation of atypical lymphocytes." It occurs as (*1*) a localized or (*2*) a diffuse process. The former is more malignant than the latter, but its rapid course as well as the occurrence of intermediate types, indicates that there is no other important distinction between them. It is distinguished from the other types of lymphoma by its local destructive capacity and by the formation of true metastases in distant regions.

*Microscopic Appearance:* This type of tumor is expansive, infiltrating and invasive. It spreads through the regional lymphatics and, by rapid proliferation, in loose connective tissue. Distant metastases may occur in bones, lungs, heart or kidney. Microscopically the growth is composed of masses of lymphoid cells in the meshes of a fine reticulum. The cells exhibit the usual characteristics of malignancy, quickly destroying the normal capsules of the lymph glands and invading the adjacent tissues. The mature lymphocytes are crowded out by the larger hyperchromatic cells, which contain a small amount of basophilic cytoplasm together with a round or oval nucleus and a prominent nucleolus. Mitoses may be present but often are not easy to recognize. The uniformity of cell type is an outstanding feature

of this disease. There is no increase in reticulum as shown by silver stain. Those fibers which are present represent the original content of the node, and these are greatly dispersed by the infiltration of neoplastic cells, so that they may appear decreased in number upon microscopic examination. Structurally this tumor, as described by Kundrat, is composed of lymphoid cells of variable size lying in a reticular tissue. All in all, the structure of lymphosarcoma is rather specific, as it presents a diffuse growth of lymphoid cells lying in reticular tissue. The cells vary in size, some being large and some small. The nuclei are compact or vesicular and are always hyperchromatic.

## SYMPTOMS

Lymphosarcoma is rarely diagnosed prior to operation, and it is most frequently recognized on the autopsy table.[6] No constant or consistent group of symptoms has occurred in any of the cases reported.

The first attack may simulate acute abdominal infection and is frequently diagnosed as acute appendicitis or as a generalized constitutional symptom of anemia, cachexia or weakness. Any pain associated with this disease is usually colicky, with little tendency to localize. In the intestinal variety blood may be observed in the stool, and massive intestinal hemorrhage has occurred in some cases. Intussusception also has occurred. Perforation of the bowel has been known to occur. Obstruction is present in from 50 to 60 per cent of the intestinal cases. Age does not seem to have any bearing on the matter; the patients range from 1 to 70. The average age is about 40. Male patients show a slightly higher frequency of involvement than do female patients, the ratio being about 5 to 2. Irregular fever and progressive cachexia are common to all forms of the disease. Pain from involvement of the regional nerves occurs eventually in some cases. When the tumor is located in the retroperitoneal and mediastinal regions the pain is especially distressing. With regard to the intestinal type of neoplasm, a recent review of Carson's[7] reveals that 20 per cent of the lesions were primary in the ileum. Symptoms vary as to the location of the tumor. For this reason Boyd,[8] for descriptive purposes, divided lymphosarcomas into a number of groups depending on the principal or primary site of tumor formation: (*1*) cervical, (*2*) axillary, (*3*) inguinal, (*4*) pharyngeal, (*5*) mediastinal and (*6*) abdominal. The great variety of symptoms that may occur as a result of lymphosarcoma in each or all of these various locations cannot be included in this review, which is limited chiefly to lymphosarcoma of the abdominal type, with special reference to the retroperitoneal.

## DIAGNOSIS

The diagnosis depends upon the symptoms already discussed, and usually upon the presence of a mass. From Carson's recent discussion of retroperitoneal tumors it is apparent that the differential diagnosis of retroperitoneal lymphosarcoma is difficult. Carson[9] classified retroperitoneal tumors as follows: (1) lipoma, liposarcoma; (2) myxoma, myosarcoma; (3) teratoma; (4) lymphoma,

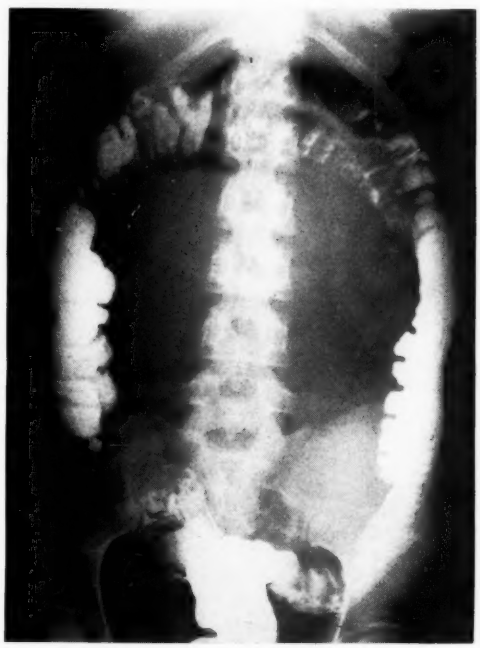

Fig. 1.—Roentgenogram showing large mass almost completely filling abdomen.

Fig. 2.—Retroperitoneal mass after removal.

lymphosarcoma (Hodgkin's); (5) ovarian cystoma; (6) adenocystoma; (7) chorioepithelioma; (8) neuroblastoma; (9) leiomyoma, leiomyosarcoma; (10) fibroma, fibrosarcoma, and (11) adenoma, adenocarcinoma.

As has been mentioned, it is with the abdominal group that this paper proposes to deal. Once the diagnosis is made, two varieties of lymphosarcoma must be distinguished. In the first the disease appears to be in the retroperitoneal or the mesenteric lympth nodes, while in the second the starting point seems to be in the intestinal lymph tissue. This is true particularly in the lower part of the ileum. Lymphosarcoma is distinguished from other forms of lymphoma by its local destructive capacity and by the formation of true metastases in different organs. Fever is often a prominent symptom, but anemia and cachexia may not appear until toward the end of the disease. In comparing patients with lymphosarcoma with those suffering from Hodgkin's disease it may often be noted that the former do not appear seriously ill until shortly before death, while the typical patient with Hodgkin's disease is feeble, emaciated and cachectic for a long time prior to death. Clinically the disease is progressively fatal. Its symptoms are more local than general and are largely due to pressure produced by the large lympoid masses that result.

Lymphoid tissue in any part of the body may be involved, so that not only the lymph nodes but other structures, such as the spleen, the liver and especially the gastrointestinal tract, may be sites of tumor formation. The characteristics that distinguish lymphosarcoma from other conditions that resemble it in a confusing way are best recorded in a comparative form. From a study of the cells in a single section it would probably be impossible to distinguish between chronic lymphoid leukemia, lymphosarcoma, and small round cell sarcoma. In chronic leukemia the glands become enlarged but remain discrete. There is dissemination of lymphoid cells in the capillaries of organs otherwise practically unchanged, and there is the leukemic state of the blood. In lymphosarcoma there is an invasive or infiltrating lymphoid growth that has a peculiar regional way of spreading and tends to be limited either to the thorax or to the abdomen. There is no leukemic change of the blood picture. Round cell sarcoma offers much less difficulty. It starts anywhere in the connective tissue as a single tumor nodule that invades the surrounding tissues and metastasizes by way of the blood stream, forming new discrete nodules in such distant organs as the lungs, liver, etc. When lodged in the lymph gland it produces a solid nodule with an outline, outside which some remnant of the gland may be found unchanged. All others cause a complete replacement of the gland, although occasionally a localized lymphosarcomatous infiltration may leave the rest of the gland intact.[10]

## TREATMENT AND PROGNOSIS

The treatment of lymphosarcoma is chiefly irradiation. This tumor is highly radiosensitive, and marked regression in size of a lymphosarcoma is usually evident after the use of roentgen therapy.

However, the outcome is usually that of a progressive fatality, and, although irradiation is of value, the overall picture is not good.

## REPORT OF CASE

Mrs. A. M., aged 23, was admitted to the hospital on Sept. 27, 1948. Her chief complaint was that she had noticed a large mass on the left side of the adbomen for the past six months. She had had the usual childhood diseases without sequelae, and

there was no history of any serious previous illnesses, accidents, injuries or surgical operations. Menstruation had begun at the age of 12, and except during a recent pregnancy there had been no alteration in the menstrual cycle.

The patient had been married for two years. Her husband's health was good. There was no clinical, familial or marital history of tuberculosis, cancer or venereal disease. The patient had always been healthy and had led a normal and uneventful life up until the time of her present illness. Six months prior to admission, while she was still pregnant, she noticed a mass in the left upper abdominal quadrant. She consulted her physician about this, but as far as can be determined nothing was done. The patient continued through her pregnancy, and three weeks prior to her admission to the hospital had delivered at home a normal living male infant. Delivery had been spontaneous, and there had been no apparent complications. She had noticed throughout her pregnancy that instead of gaining weight she was losing it, and after her pregnancy she found that she weighed 21 pounds (9.5 Kg.) less than she had weighed before she became pregnant. The mass had become progressively larger during pregnancy, but her physician had told her that this "was to be expected." She noticed that she had become very pale and that her appetite was failing rapidly.

After delivery the mass did not disappear, but became larger and harder. It did not trouble the patient beyond her constant awareness of its presence. She stated that it worried her a great deal. Evacuation was apparently normal, and the patient complained of no symptoms referable to the urinary tract. She had had some mild backache but had ascribed it to pregnancy, and when it continued she was not alarmed about it. Gradually, however, owing to the increasing size of the mass, it became difficult for her to sit down or lie down with any degree of comfort. She was most comfortable when standing.

Physical examination revealed a temperature of 100 F., a respiration rate of 22, a pulse rate of 90 and a blood pressure of 100 systolic and 60 diastolic. The patient was pale and emaciated. The skin was scaly. There were no petechiae or cutaneous rashes. The head was of normal contour, but the skin over the head was shrunken and the eyes were sunken. There was no evidence of osseous disease or exostosis of the skull. The pupils were dilated but equal; they reacted to light and accommodation. Examination of the fundi revealed nothing of significance. The neck was thin, and in the left supraclavicular region was a small hard node. The breasts were small and atrophied, but no masses were present. The heartbeat, although rapid, was regular, and there was no evidence of murmur, arrythmia or enlargement. Examination of both lung fields revealed them clear to percussion and auscultation. The abdomen was enlarged to about the size of a full-term pregnancy. The distended area was hard. It was limited chiefly to the upper and lower left abdominal quadrants. The mass itself was well defined and not easily movable. It was not tender but had a definite nodular feeling.

The liver was slightly enlarged to below the right costal border, and the spleen was not palpable There was some evidence of shifting dullness, suggesting the probability of ascites. Examination of the genitourinary tract revealed no evidence of tenderness in the renal area, and as far as could be determined the remainder of the genitourinary tract was within normal limits. The skeletal system showed no evidence of limitation of motion, osseous disease or exostosis.

Neurologic examination revealed the reflexes to be equal and active and other Babinski reflexes to be negative. Examination of the lymphatic system at the time of admission showed no evidence of lymphadenopathy except in the left supraclavicular region. Vaginal examination revealed the uterus to be small and pushed to the right; the tumor mass was just palpable above and a little to the left of the uterus. As far as the adnexae were concerned, no masses were felt. The mass was hard to vaginal palpation and seemed movable. There was no evidence of vaginal discharge. Rectal examination revealed the lower part of the rectum as far as the examining finger could determine, to be free of any masses, but at the tip of the examining finger the aforedescribed mass could be palpated lying on the left side. The muscular system revealed some evidence of muscular atrophy, especially in the limbs.

Laboratory tests on admission revealed the urine to be acid, with 1 plus albumin and no sugar. Rare hyaline casts were present. A few pus cells and a few epithelial cells were observed in the catheritized specimen. Examination of the blood revealed a negative Wassermann reaction. The blood was type A and Rh positive. The value for hemoglobin was 74 per cent. The leukocyte count was 11,650 per cubic millimeter of blood, with 86 per cent polymorphonuclears, 13 per cent small lymphocytes and 1 per cent monocytes. The stools gave negative results for occult blood, ova or parasites.

Roentgen examination (Fig. 1) revealed a large mass almost completely filling the abdomen. This mass was circular, and the transverse colon appeared to follow around it.

Fig. 3.—Photomicrograph of pathologic section of tumor, × 150.

After admission to the hospital the patient was given 1 pint (473 ml.) of blood, and the hemoglobin value rose to 82 per cent. The erythrocyte count rose from 3,720,000 to 3,930,000 per cubic millimeter of blood. There was no appreciable change in the leukocyte count. Two days after admission an exploratory operation was performed with the patient under closed ether anesthesia. A left rectus-splitting incision was made. The uterus and adnexae revealed nothing remarkable. However, lying just above the pelvic brim in the left lumbar gutter a large retroperitoneal mass was observed. The peritoneum immediately over this mass was thickened and injected. The thickening of the peritoneum extended from the posterior wall up to the anterior wall itself. For this reason it was almost impossible to strip the peritoneum free and approach the mass by a retroperitoneal route. An incision was made, therefore, through the posterior peritoneum, and the mass was dissected out from its bed. It was found to be closely adherent to the lower pole of the left kidney. Blunt dissection proved easy, and only mild venous oozing was encountered.

After removal of the mass, the peritoneum was closed over its bed and the remainder of the abdomen was explored. Exploration revealed no evidence of hepatic involvement and no metastases to any other of the abdominal organs. The abdomen was then closed, and the patient was returned to her room in good condition. Her postoperative course was rather stormy, but after four days her condition quieted. She was discharged from the hospital on the twelfth postoperative day.

Pathologically the growth was first diagnosed as malignant neuroblastoma, but further study resulted in a diagnosis of lymphosarcoma. The specimen (Fig. 2) was a mass 20 cm. in length and 50 cm. in its other diameter. It weighed 8 pounds (3,629 Gm.). It had a thick capsule. The surface was glistening but somewhat nodular. When sectioned, the entire structure was seen to consist of friable cream-colored tissue. Throughout this tissue were various-sized areas of hemorrhagic material. The cellular structure upon final microscopic study was that of lymphosarcoma.

After her discharge from the hospital the patient was referred for roentgen therapy, with resultant recession in the size of the mass itself, but there was no general improvement. The patient lost about 25 pounds (11.3 Kg.) more in weight and began to show evidence of metastases in the rectum

Fig. 4.—Photomicrograph of tumor mass, × 350.

and the liver. Ascites finally developed, and about 5 gallons (19.9 L.) of ascitic fluid was removed from the abdomen on an average of about once a week. Her course continued down hill, and she died six months after the original operation.

At autopsy the entire abdominal cavity was observed to be riddled with metastases from the original tumor. These involved the peritoneum, the liver, the stomach, the omentum and the gastrointestinal tract. The entire gastrointestinal tract was matted together with cream-colored, friable metastatic growths. The liver revealed numerous patches of ivory-colored homogenous tissue, rather rubbery. On section, these showed small areas of orange-colored tissue scattered in small irregular foci throughout the tumor masses. Microscopic sections of the tumor (Figs. 3 and 4) showed closely packed round cells with large nuclei and but little cytoplasm.

Many of the nuclei exhibited nucleoli. Mitoses were moderately numerous. Fine strands of fibrous tissue coursed through the tumor, and in a few places fibrosis was relatively prominent. The neoplastic cells showed no definite arrangement. Sections of the various specimens were invaded by a similar neoplasm. The histologic picture was that of a malignant lymphoma, predominantly lymphoblastic (lymphosarcoma). According to the pathologic report evidently began in the retroperitoneal lymph nodes.

SUMMARY

1. A case of retroperitoneal lymphosarcoma complicating pregnancy is reported.

2. A brief discussion of lymphosarcoma with regard to morbid anatomy, microscopic appearance, diagnosis and symptoms is given.

3. A review of the literature, with special attention to lymphosarcoma of the retroperitoneal variety, is presented.

RÉSUMÉ

1. On rapporte un cas de lymphosarcome rétropéritonéal compliquant la gestation.

2. On fait une brève discussion du lymphosarcome sur l'anatomie pathologique d'apparence microscopique. On fait un exposé du diagnostic et des symptômes.

3. On fait une revue des articles parus, en accordant un intèrêt particulier au lymphosarcome de la variété rétropéritonéale.

RESUMEN

1. Se describe un caso de linfosarcoma complicando el embarazo.

2. Se estudia la anatomía patológica, aspecto microscópico, diagnóstico y síntomas del linfosarcoma.

3. Se pasa revista a la literatura médica, prestando una atención especial al linfosarcoma de tipo retroperitoneal

RIASSUNTO

1) Descrive un caso di linfosarcoma restroperitoneale complicante la gravidanza.

2) Discute brevemente l'anatomia patologica e la diagnosi dei linfosarcomi.

3) Passa in rassegna la letteratura sull 'argomento, con particolare riguardo alla varieta' retroperitoneale.

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## The International College of Surgeons

## announces extension of the deadline for the

## Hippocrates Essay Contest
## to May 1, 1950

In appreciation of the fine response to date, the Contest Committee has voted to prolong the period during which submissions will be received. The title of the essay is "The Meaning of Hippocrates in the Medical World of Today"; the award, a $100 Government bond. There is no restriction as to eligibility or as to the length of the essay. Dr. Skevos Zervos, noted Greek physician and authority on the life of Hippocrates, heads the judges' committee. All manuscripts should be addressed to

Hippocrates Essay Contest
1516 Lake Shore Drive, Chicago 10

and must be postmarked not later than May 1, 1950.
The winning essay will be published in the *Journal.*

# Incidence of Hepatic Dysfunction in Chronic Calculous Cholecystitis

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PAUL GROSS, M.D., F.A.C.P., F.C.A.P.
PITTSBURGH, PA.

IT has been of some concern to us and to many of our associates that a certain number of cholecystectomized patients return with complaints similar to those existent prior to the operation. Failure of cholecystectomy to relieve patients of their complaints is so much more frequent in cases of noncalculous than in calculous cholecystitis that many surgeons are reluctant to remove a gallbladder affected with the former.

In our opinion the primary reason for failure of cholecystectomy to relieve all patients lies in an associated dysfunction of the liver. This is not a new idea; Dr. E. A. Graham[1] observed hepatic disease associated with chronic cholecystitis more than thirty years ago. However, because disease or dysfunction of the liver has proved difficult to detect early, many surgeons feel that liver function tests are of little value.

The more recently introduced flocculation tests, namely tests for cephalin-cholesterol flocculation and thymol turbidity, have proved more sensitive than any previously used for detecting early hepatic dysfunction.[2] With emphasis placed upon these more sensitive tests, we reviewed 129 cases of chronic cholecystitis with stones. In all of these cases the patients were operated upon and the diagnosis confirmed by gross and microscopic pathologic examination. The determination of hepatic dysfunction was based upon abnormal values indicated by the flocculation test and other commonly used tests, as follows:

| *Test* | *Pathologic Level* |
|---|---|
| Thymol turbidity | more than 4 units |
| Cephalin-cholesterol flocculation | 2 plus or more in 48 hours |
| Serum albumin | Below 4 Gm. per 100 ml. |
| Serum albumin-globulin ratio | Below 1.5 |
| Serum bilirubin | Over 0.5 mg. per 100 ml. |
| Serum alkaline phosphatase | Over 15 King-Armstrong units |

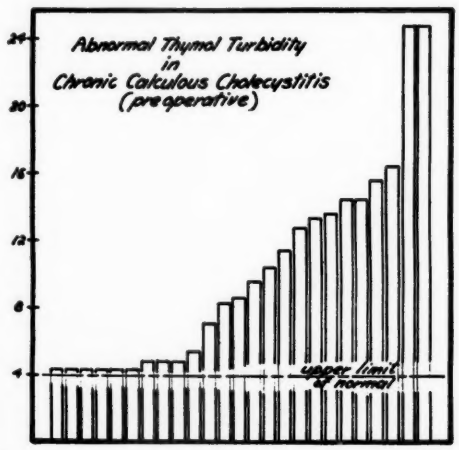


Fig. 1. Graphic representation of abnormal thymol turbidity levels in 25 patients with chronic calculous cholecystitis.

Preoperative disturbance of hepatic function was observed in 28 per cent of 129 patients subjected to cholecystectomy (36 patients).

The distribution of the 36 cases with respect to the type of test used is given in Table 1.

Abnormal values for thymol turbidity were noted in 25 cases. The distribution of these values is illustrated in Fig. 1. In 10 cases there were values between 4.3 and 5.4 units and in 4 between 7.1 and 9.5 units. In the remaining 11 the values ranged between 10.3 and 25 units.

Of the 36 cases in which there were abnormal test values, the cephalin-cholesterol flocculation test was performed in 24. As may be noted

From the Surgical Service and the Pathological Laboratory of St. Joseph's Hospital, Pittsburgh.
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TABLE 1.—*Hepatic Dysfunction in 129 Cholecystectomized Patients*

| | |
|---|---|
| Total incidence of abnormal tests | 36 (28%) |
| Abnormal flocculation* only | 23 |
| Abnormal thymol turbidity only | 10 |
| Abnormal flocculation plus other tests | 3 |
| Abnormalities in other than flocculation tests** | 10 |

*Thymol turbidity and/or cephalin flocculation tests.
**Exclusive of serum bilirubin.

TABLE 2.—*Cephalin Flocculation in Chronic Cholecystitis*

| | *Degree of flocculation* | *Number of patients* |
|---|---|---|
| Normal | 0 | 5 |
| | + — | 1 |
| | + = — | 5 |
| Pathologic | 2 + = — | 7 |
| | 3 + = — | 3 |
| | 4 + = — | 3 |

from Table 2, abnormal values were discovered in more than one-half of this group.

Only 10 patients showed serum bilirubin values of over 2 mg. per hundred milliliters (level of clinical icterus). In some of these cases needle biopsy specimens of the liver were obtained by means of a Vim-Silverman needle. All of the specimens showed focal hydropic degeneration of the hepatic cells. The latter were so swollen that the sinusoids were all but obliterated. The type of degeneration was similar to that recently described by Popper, Steigmann and Szanto[3] and classified as Grade III (Fig. 2). In 2 cases there was indisputable evidence of inflammation characterized by exudation of monocytes, lymphocytes and polymorphonuclear leukocytes about small bile ducts (Fig. 3). In these cases the thymol turbidity value was 5.4 and 7.1 units and the cephalin flocculation value 2 and 3 plus, respectively. The thymol turbidity values in other cases ranged from 8.5 to 15.6 units and the cephalin-cholesterol flocculation values from 0 to 2 plus. The liver biopsy specimen in each case was taken from the anterior aspect of the right lobe, approximately 10 cm. from the inferior edge.

It has been possible to reexamine 27 patients at varying intervals after cholecystectomy. Nineteen showed pathologic levels on preoperative tests of liver function. In the other 8 the preoperative status of liver function is not known. The results are listed in Table 3.

TABLE 3.—*Postoperative Evaluation of Cholecystectomized Patients*

| | *Interval since operation* | *Thymol turbidity* | *Cephalin flocculation* |
|---|---|---|---|
| Patients clinically improved, with normal test levels, 7 (26%) | 8 mo. | 3.7 | + — |
| | 1 yr. | 2.0 | + — |
| | 1½ yrs. | 3.7 | 0 |
| | 2 yrs. | 2.5 | + — |
| | 3 yrs. | 2.6 | 1 + = — |
| | 3 yrs. | 2.8 | + — |
| | 3 yrs. | 2.5 | + — |
| Patients clinically improved, with abnormal test levels, 14 (52%) | 1 mo. | 2.8 | 3 + = — |
| | 2 mo. | 14.4 | 1 + = — |
| | 2 mo. | 3.7 | 4 + = — |
| | 2 mo. | 4.8 | 0 |
| | 2 mo. | 5.4 | 2 + = — |
| | 3 mo. | 6.0 | 0 |
| | 6 mo. | 4.3 | + — |
| | 15 mo. | 4.3 | 0 |
| | 1 yr. | 11.3 | 0 |
| | 1 yr. | 4.3 | 0 |
| | 1 yr. | 13.2 | 2 + = — |
| | 1 yr. | 4.3 | 0 |
| | 3 yrs. | 4.3 | 3 + = — |
| | 4 yrs. | 8.2 | 1 + = — |
| Patients clinically unimproved, 6 (22%) | 3 mo. | 6 | 0 |
| | 5 mo. | 14.4 | 3 + = — |
| | 18 mo. | 14 | 4 + = — |
| | 2 yrs. | 25 | 4 + = — |
| | 2½ yrs. | 12.7 | 4 + = — |
| | 4 yrs. | 4.3 | 4 + = — |

## COMMENT

Emphasis has been placed throughout this presentation upon the flocculation tests as a measure of hepatic dysfunction. Both the cephalin-cholesterol flocculation test and the thymol turbidity test involve reactions with serum globulins. The former is dependent upon the gamma globulins; the latter, upon lipid-globulin combinations. The production of globulins is considered to be the function of reticuloendothelial cells, which are abundant in the liver.

Both flocculation tests have been proved to offer satisfactory sensitivity and are of great practical worth in the evaluation of various types of organic disease of the liver. There is reason to believe, however, that these tests may yield pathologic values in conditions other

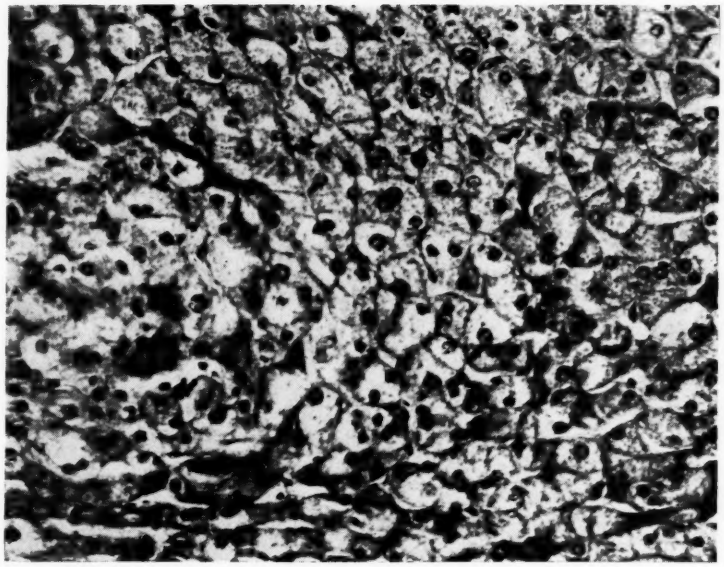

Fig. 2. Photomicrograph of liver biopsy specimen, showing severe hydropic degeneration. The sinusoids are practically obliterated. The liver cells are swollen, the cell boundaries ruptured. The nuclei vary in size. Some are pyknotic, others show karyolysis. In a few cells the nuclei are absent.

than primary disease of the liver. Chronic ulcerative colitis and infectious mononucleosis are examples of diseases in which abnormal flocculation values may appear. In consideration of the fact that hepatic lesions have been observed microscopically in cases of infectious mononucleosis and that hepatic fatty change is not uncommon with chronic ulcerative colitis and other nutritional disorders, the occurrence of abnormal flocculation values in association with these diseases may justifiably be interpreted as reflecting secondary liver involvement or dysfunction.

A similar concept applies to our cases of gallbladder disease. It is our opinion that the pathologic levels noted in the various tests applied to our patients reflect hepatic dysfunction. Support for this theory is gained from the pathologic reports, which indicate demonstrable lesions in biopsy specimens removed from the liver at the time of cholecystectomy. Degenerative changes were demonstrable in all our liver biopsies.

Hepatic involvement in disease of the gallbladder is usually considered secondary to the latter and is envisioned by the surgeon as ascending choleangiolitis. Direct proof for the occurrence of choleangiolitis is afforded by some of the liver biopsies. Indirect, presumptive evidence is furnished by patients without biliary obstruction who improve promptly after cholecystectomy and in whom the pathologic levels revealed by hepatic function tests likewise improve.

Pathologic values on flocculation tests or other tests (observed in 28 per cent of our series) together with the continuance of symptoms years after cholecystectomy (as in 22 per cent of our follow-up group) suggest that the symptoms of the unimproved patients stem from the liver. It appears probable that the generally unsatisfactory surgical results obtained in cases of so-called noncalculous cholecystitis may have a similar background. Most, if not all, of the symptoms in such cases may also be present in cases of hepatitis.

It should be pointed out that the 28 per cent incidence of hepatic dysfunction among our 129 cholecystectomized patients does not represent the true incidence. Many patients

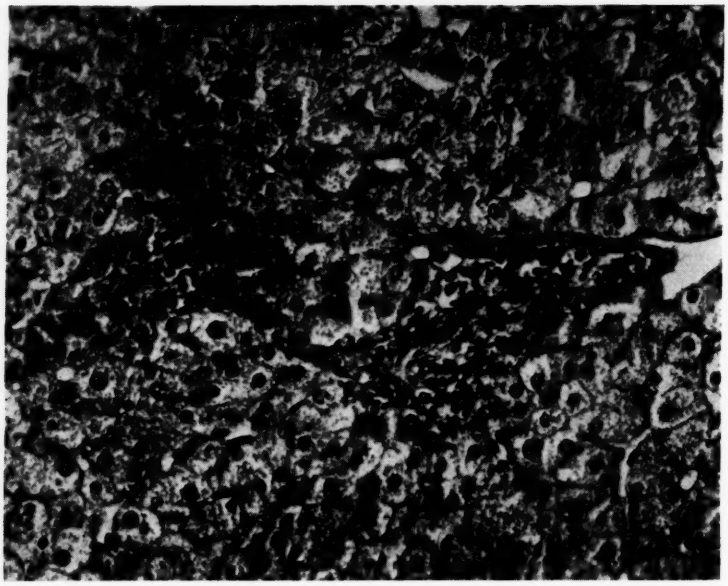

Fig. 3. Photomicrograph of liver biopsy specimen, showing inflammatory exudate in addition to hydropic degeneration. The inflammatory exudate is situated about the bile ducts and consists of lymphocytes, monocytes and scattered polymorphonuclear leukocytes.

had only one or two or, at the most, five tests recorded. The more sensitive flocculation tests were not done on all the patients. Our 28 per cent incidence is therefore a minimal figure, and the true incidence is probably higher. However, there is need for some caution, since Popper and Steigmann[28] have recently called attention to the occasional occurrence of "biologically false positive" results from the thymol turbidity test and the cephalin-cholesterol flocculation test.

Determination of the true incidence of hepatic dysfunction in cases of chronic disease of the gallbladder requires further study of a much larger series of cases than is here presented. Such a study should include the more sensitive flocculation tests.

SUMMARY

1. A study was made of liver function tests in a series of 129 cholecystectomized patients. These patients had chronic cholecystitis with stones. Emphasis was placed on the sensitive thymal turbidity test and the cephalin-cholesterol flocculation tests, both of which are more sensitive than tests formerly applied.

2. Evidence of hepatic dysfunction was found in 28 per cent of the patients in this series.

3. Follow-up studies of 27 patients showed clinical improvement in 78 per cent and no clinical improvement in 22 per cent. The results of liver function tests were abnormal for all of the unimproved patients (five months to two years after cholecystectomy). Two-thirds (14 of 21) of the clinically improved patients showed some evidence of disturbed hepatic function one month to one and one-half years after the operation.

RÉSUMÉ

(1) On fait une étude de tests de la fonction hépatique dans une série de 129 malades cholécystectomises. Ces malades présentaient de la cholécystite chronique avec calculs. On attira l'attention sur la sensibilité du test au thymol troublé et des tests de floculation céphaline-cholestérol; tous les deux sont plus

sensibles que les tests employés auparavant.

(2) On met en évidence le mauvais fonctionnement hépatique chez 28% des malades de cette série.

(3) Les études qui suivent, portant sur 27 patients, montrent une amélioration clinique dans 78% des cas et pas d'amélioration dans 22%. Les résultats des tests de la fonction hépatique furent anormaux pour tous les malades non améliorés (5 mois à 2 ans après la cholécystectomie). Deux tiers (14 sur 21) des malades amóliorés cliniquement présentèrent quelques symptômes de fooncion hépatique troublée depuis un mois jusqu'à une ou une année et demi après l'opération.

RESUMEN

1. Se ha estudiado la función hepática mediante una serie de pruebas en 129 pacientes colecistectomizados para tratarles de colecistitis crónica calculosa. Las pruebas más exactas resultaron ser las de la turbidez del timol y la de la floaculación de la cefalina-colesterol, que son mucho mas sensibles que todas las usadas anteriormente.

2. Se hallaron síntomas de disfunción hepática en el 28 por ciento de los pacientes estudiados en la presente serie.

3. Los estudios realizados en 27 pacientes después de ser intervenidos, revelaron una mejoría clinica en el 78% de los casos, no mejorando el 22% de los pacientes. Los resultados de las pruebas de la función hepática fueron anormales en todos los pacientes que no habían mejorado (cinco meses a dos años después de la colecistectomía). Dos tercios (14 de 21) de los pacientes mejorados clínicamente presentaron ciertos signos de alteraciones de las funciones hepáticas, de un mes a un año y medio después de la operaciòn.

RIASSUNTO

(1) Hanno eseguito prove funzionali del fegato in 129 pazienti operati di colecistectomia per colecistite cronica e colelitiasi. Attribuiscono un particolare valore al metodo di torbidita' col timolo ed al metodo di flocculazione con cefalina-colesterina, ambedue piu' sensibili dei metodi usati in precedenza.

(2) Nel 28% di questi pazienti hanno notato segni di disfunzione epatica.

(3) Controlli a distanza sopra 27 pazienti hanno dimostrato un miglioramento clinico nel 78% dei casi: nel 22% il miglioramento e' mancato.

In tutti i casi non migliorati, le prove funzionali hanno condotto (da 5 mesi a 2 anni dopo l'operazione) a dei risultati anormali. Qualche disturbo funzionale e' stato notato anche nei 2/3 dei casi (in 14 sopra 21) migliorati clinicamente: in questo gruppo di casi il controllo ha oscillato da un minimo di 1 mese ad un massimo di 1 anno ½ dopo l'operazione.

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# Rectosigmoid Anastomosis by Invagination in Chronic Inflammatory Conditions

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CHARLESTON, S. C.

ANASTOMOSIS by invagination makes possible the reestablishment of continuity between the rectum and the sigmoid under some conditions in which other methods would not be applicable. End-to-end anastomosis is technically difficult in the depth of the pelvis and requires mobilization and accurate suturing of approximately normal pliable bowel. Anastomosis by invagination is much easier of performance, as the rectal end is not mobilized and the sigmoid is held within it by a tube passing through the anal orifice, few if any sutures being placed at the line of anastomosis.

This type of anastomosis is particularly applicable when chronic inflammatory processes prevent mobilization of the rectum without damage to it. In such cases the anastomosis is not done at the time of the primary operation, on account of the attendant risk, but is done as a secondary procedure. Owing to the lack of a firm and accurate approximation of the bowel ends by suture and the presence of chronic local inflammatory changes, it is important that the anastomosis be protected against factors that may cause leakage. Protection is best accomplished by a preceding transverse colostomy. This permits better preparation of the bowel, minimizes the danger of peritonitis from leakage at the site of the anastomosis, reduces the likelihood of abdominal distention and affords a safe means of dilating the site of anastomosis and ascertaining its adequacy before it is permitted to function.

When a transverse colostomy has not been made and there is a sigmoid colostomy that must be abandoned to permit mobilization of the sigmoid to a sufficient extent to reach the rectum, particular care must be taken in preparation of the bowel and in the use of measures to prevent postoperative distention.

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## TECHNIC

At operation the colon is mobilized sufficiently to permit its end to reach the rectum. This may be difficult because of extensive adhesions and because it has been shortened by resection of its diseased portion. It may be necessary to free the splenic flexure. The rectal stump is located by palpating the end of a tube that has been passed through the anal orifice. The end of the tube is drawn into the abdominal cavity through an incised opening made into the rectum, just large enough to permit a snug fit of the end of the sigmoid. No rectal mucosa is excised. The rectal tube is passed about 8 cm. into the sigmoid and secured against slipping and leakage by a heavy encircling transfixion suture (Fig. 1). By traction upon the rectal tube, the sigmoid, with mesentery attached, is drawn into the rectum until a section of reasonably intact bowel is engaged for a length of several centimeters (Figs. 2 and 3). The proximal end of the rectal tube should be above the level of the rectal stump. Several sutures may be placed in the region of the anastomosis, but the end of the sigmoid is held in place mostly by the rectal tube, which is prevented from slipping by securing a gauze sponge around it just outside of the anal orifice (Fig. 3). The tube is kept open by irrigation and permits the passage of gas and liquid feces. The sutures holding it to the sigmoid slough out, and it may be withdrawn or expelled about the seventh day. After its removal there is commonly some constriction, probably due to edema of the invaginated portion of sigmoid. This is overcome by dilation, which is most safely carried out by drawing bougies from above downward on a guide string that has been passed through the distal colostomy opening downward to the outside through the anal orifice. When a colostomy is not present, dilation must be deferred for two weeks or longer, until the anastomotic union is secure, and then carried out by gently passing soft rubber bougies upward through a proctoscope under direct vision. Once an adequate lumen has been established there is no tendency to re-formation of stricture. The invaginated portion of bowel sloughs off or shrinks so that the site of anastomosis is recognized only by a slight but irregular redundancy of the mucosa. The function of the rectum becomes normal.

## COMMENT

Rectosigmoid anastomosis by invagination is not a new procedure. In 1908 Mummery[1] reported using it with success as a means of restoring bowel continuity in a case of resection of the sigmoid for a neoplasm. Shortly thereafter, in a communication to the editor of the *Lancet*, G. Grey Turner[2] stated that J. Rutherford Morison[3] had devised and carried out the identical operation in 1896, and that up to the publication of his paper in 1901 he had performed the operation fourteen times. Although it had sometimes been wonderfully successful, the mortality had been high, and it had been almost entirely superseded by other methods. He predicted that Mummery would have the same experience if he persisted in using it. In 1918 Stillman[4] reported the use of this procedure in cases of obstruction due to tumor of the lower sigmoid. After resection he closed the end of the sigmoid with an inversion suture and invaginated it into the rectum, denuded of its mucosa. He attributed his success to the fact that the occluded, distended sigmoid firmly approximated the rectum, thus preventing leakage and favoring firm healing. Drainage was instituted through the vagina or below the end of the coccyx. A fecal fistula of one to several weeks' duration occurred in about a third of the cases. Stillman considered this operation preferable to a colostomy or a two-stage procedure. Invagination of the sigmoid into the rectum by traction from below has been used by Balfour[5] as a means of immobilizing the bowel while making an accurate suture anastomosis after resection.

In spite of its long history and its prominent advocates, anastomosis of the rectum to the sigmoid by invagination without accurate suturing has gained little popularity. This is partly accounted for by the fact that it has been used mostly as a primary form of anastomosis at the time of extensive bowel resection. When used in this manner it is accompanied by high morbidity and mortality rates. Also, better preparation of the patient and technical improvements in operating and anesthesia have made end-to-end anastomosis by accurate suturing preferable in most cases. Anastomosis by invagination is particularly indicated when chronic inflammatory changes prevent satisfactory mobilization of the rectum and make it impossible to obtain sufficiently pliable and intact ends of bowel to permit accurate approximation by suture. When the procedure is used under these conditions it is most important that the site of anastomosis be protected, preferably by a preliminary transverse colostomy or by an accompanying tube cecostomy and intestinal intubation. Three consecutive cases, with successful results, are reported.

## REPORT OF CASES

CASE 1.—W. A., a critically ill Negro aged 43, was admitted to the Roper hospital May 5, 1940, with a diagnosis of intestinal obstruction of five hours' duration. At operation, a few hours later, massive volvulus of both small and large intestine was observed. There was resected 260 cm. of ileum and jejunum and 25 cm. of terminal sigmoid colon, all of which was gangrenous. The proximal end of the small intestine was anastomosed to the ileum, an enterostomy being made proximal to the anastomosis. The proximal end of the sigmoid was brought out through a left muscle-splitting incision. The

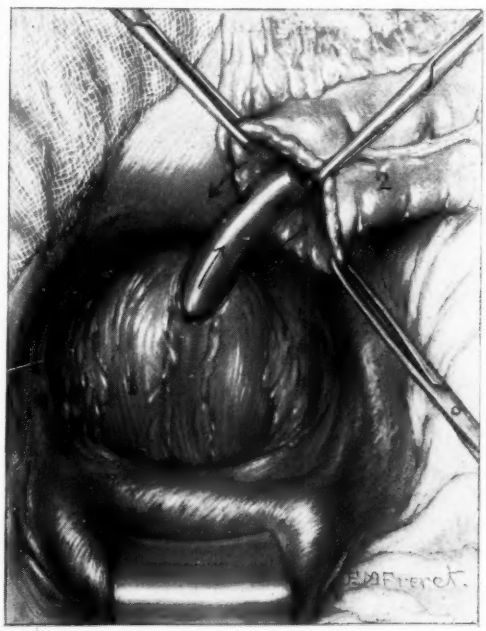

Fig. 1.—Tube passed per anus through incision in rectal stump and introduced into mobilized end of sigmoid colon. *1*, rectum; *2*, sigmoid; *3*, bladder.

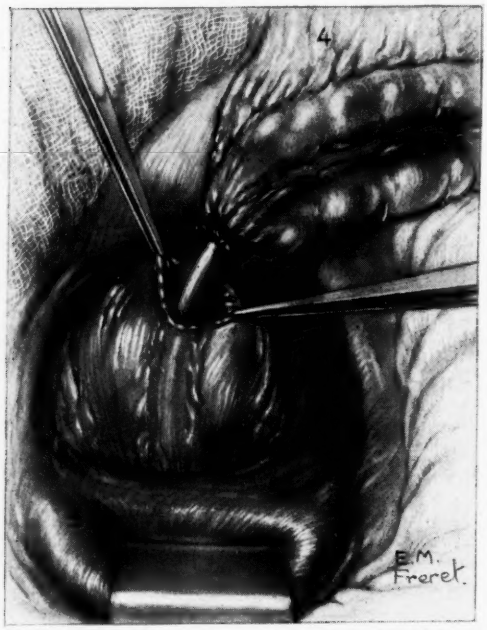


Fig. 2.—End of sigmoid colon being invaginated into rectum. *1*, rectum; *2*, sigmoid; *3*, bladder; *4*, sigmoid mesentery.

distal end, which was at the pelvic brim, was closed by inversion.

Convalescence from this operation was remarkably smooth. The enterostomy closed spontaneously and the colostomy functioned well. On June 25 a transverse colostomy was made at the upper end of a left paramedian incision after exploration had revealed that the remaining sigmoid was of sufficient length to be brought down to the rectum. On July 16, through a low left rectus muscle-splitting incision, after many adhesions had been severed, the end of the sigmoid was mobilized by freeing its colostomy attachment to the anterior abdominal wall and dividing its lateral peritoneal reflection. The end of the sigmoid was invaginated into the rectum according to the technic aforedescribed. Beginning July 26, ten days after the operation, attempts were made to irrigate the rectum through the distal colostomy opening to establish continuity at the site of anastomosis. On August 13 proctoscopic examination revealed redundant mucosa and some feces. On August 29 a Levine tube was passed through the colostomy and delivered through the anal orifice. Gradual dilation of the anastomotic site was then accomplished by pulling bougies from the colostomy through the anal orifice on a guide string. The moderate constriction was easily dilated. On October 1 closure of the colostomy was started by crushing the spur; this was completed November 22. On November 30 the patient was discharged in good condition, having normal bowel movements. On examination Dec. 29, 1941, more than a year later, he was enjoying good health, had normal intestinal function and had resumed his job of doing heavy labor in a fertilizer factory.

Case 2.—On April 10, 1946, M. B., a normally developed, well nourished Negress aged 48, was admitted to the gynecologic service of the Roper hospital with a diagnosis of fibromyomata uteri and cardiovascular hypertensive disease. At operation, on April 12, large myomata uteri and extensive adhesions in the pelvis were observed. At completion of supravaginal hysterectomy it was noted that the mesentery of the lower sigmoid had been torn badly and that the upper portion of the rectum had been stripped of serosa and muscularis. The patient had been in shock for an hour. At this time I was requested to render assistance. The damaged portion of the rectum and sigmoid was resected. As anastomosis was considered inadvisable, the open end of the rectum was closed by an inversion suture and the terminal end of the sigmoid was brought out through an incision in the lower left quadrant to serve as a colostomy. The floor of the pelvis was peritonealized as well as possible, and rubber tissue drains were passed through the cervical canal into the vagina. Closure of the midline abdominal incision was made with chromic catgut for the posterior layer and alloy steel wire for the anterior rectus sheath. Skin sutures were placed but were not tied until five days after operation. The convalescence was reasonably smooth. The patient was discharged May 7, 1946, at which time her general condition was good and the colostomy was functioning well. On October 2 she was readmitted for reestablishment of bowel continuity. Proctoscopic examination showed the inverted end of the rectum to be 12 cm. from the anal orifice. As a transverse colostomy was not planned, a Miller-Abbott tube was passed prior to operation. At operation on October 7, with continuous spinal anesthesia, a low left paramedian incision was made. Intestinal adhesions were freed so as to expose the pelvis. An incision was made in the rectal stump, which was located flush with the vault of the vagina as determined by palpation of forceps placed both in the vagina and in the rectum. The sigmoid was mobilized by freeing its colostomy attachment to the abdominal wall and severing adhesions and its lateral and medial peritoneal attachments. The end of the sigmoid was invaginated into the rectum by the technic described above. The

Fig. 3.—Operation completed. End of sigmoid invaginated into rectum. Rubber tube held in sigmoid by circular transfixion suture. Gauze fastened to tube at anal orifice prevents retraction. *1*, rectum; *2*, sigmoid; *3*, bladder; *4*, sigmoid mesentery.

appendix was removed, and a catheter was passed through its stump into the cecum as an additional safeguard against distention. Closure of the abdominal incision was made with chromic catgut for the posterior layer and alloy steel wire for the anterior layer. Skin sutures were placed for delayed closure. Except for a profuse watery discharge through the rectal tube on the third day after operation the patient did not have a bowel movement until the ninth postoperative day. During this time she was given a liquid diet and the Miller-Abbott tube was kept in place. Probably bowel movements

could have been started safely at an earlier stage, a moderate elevation of temperature and some low abdominal pain made it seem advisable to keep the intestines inactive until these symptoms subsided. On October 25 the patient was discharged in good condition, with satisfactory bowel movements. She was seen subsequently in the outpatient department, where bougies were passed under vision through a proctoscope to dilate a moderate constriction 12 cm. from the anal orifice on proctoscopic examination April 1, 1947, the site of anastomosis was recognized by some irregular redundancy of the mucosa and a slight degree of constriction. Fixation of the bowel prevented passage of the proctoscope, but soft bougies of the same size were passed easily.

CASE 3.—A white woman 51 years of age was admitted to the Roper Hospital Sept. 17, 1946. She had been operated upon at another hospital in March 1945, for intestinal obstruction. A pelvic abscess, presumably from a diverticulum of the rectum, was drained and a cecostomy was made. One month later a colostomy was made by inserting a tube in the sigmoid colon, there being fecal soiling of the peritoneal cavity at the time. On Feb. 28, 1946, an abdominal abscess was drained; the

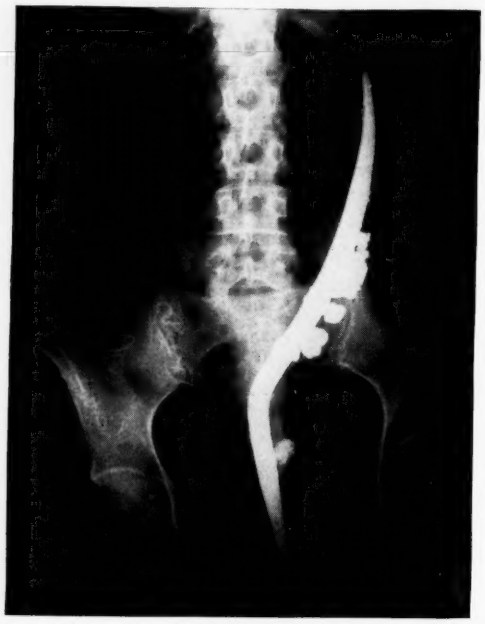

Fig. 4 (Case 3).—Soft rubber bougie passed through site of anastomosis.

Fig. 5 (Case 3).—Roentgenogram (February 1948) of distal colon with barium injection following rectosigmoid anastomosis by invagination. From site of transverse colostomy to anastomosis is almost a straight line.

details of this procedure were not recorded. On May 17, there was an operative repair of a ventral hernia. The cecostomy and the colostomy closed spontaneously, but there occurred repeated abscesses at the site of the colostomy. The patient had repeated attacks of intestinal cramps, distention and constipation. The present attack was of two weeks' duration, and there had been nausea and vomiting for the past two days.

The patient was obese. She was not acutely ill. The abdomen was protuberant, distended, tympanitic and silent. Roentgen examination showed the colon to be greatly distended with gas and obstructed in the region of the sigmoid. A diagnosis was made of intestinal obstruction due to adhesions. Intestinal intubation failed to relieve the distention. On September 30 a transverse colostomy was performed; at this operation great distention of the small and large intestine and extensive adhesions were observed. An abscess at the site of the previous colostomy, diarrhea, and excoriation of the skin delayed operation for relief of the sigmoid obstruction. On November 7, with continuous spinal anesthesia, a low transverse abdominal incision was made. The sigmoid colon was mobilized by tedious dissection severing nu-

merous adhesions and freeing it at the site of the first colostomy. A mass of inflammatory tissue that included a section of badly damaged colon was excised. Only after mobilizing the descending colon and the splenic flexure was it possible to approximate the end of the colon to the rectum. The end of the sigmoid was invaginated into the rectum by the technic described above. The incision in the abdominal wall was closed with chromic catgut in the posterior layer and interrupted cotton in the anterior layer, alloy steel wire not being available. Skin sutures were placed but not tied for several days. The thick subcutaneous layer became infected requiring subsequent partial excision of the wound with removal of cotton sutures. On November 19 the patient had her first bowel movement by rectum. On November 26, dilatation of the anastomotic site was started with esophageal bougies pulled through the distal colostomy opening by a guide string which had been passed from the colostomy downward through the anal orifice (Fig. 4). This was continued over the next two weeks without difficulty. Roentgen examination showed the colon to be almost straight from the transverse colostomy to the anal orifice (Fig. 5). On Jan. 2, 1947, an attempt to close the transverse colostomy was abandoned owing to inadequate preparation of the proximal bowel. On January 30, closure of the colostomy was accomplished with some difficulty; therefore a tube cecostomy was performed. On February 12 the patient was discharged in good condition. On February 24 her bowel movements were normal. On proctoscopic examination there was seen an irregularity of the mucosa at the 13-cm. level above the anus. The lumen appeared adequate, but the proctoscope could not be passed through it on account of fixation of the bowel.

## SUMMARY AND CONCLUSIONS

Rectosigmoid anastomosis by invagination is possible in some cases in which end-to-end suture cannot be performed satisfactorily. A brief review of the subject is presented. Three consecutive successful cases are reported.

## RÉSUMÉ ET CONCLUSIONS

L'anastomose rectosigmoïde par invagination est possible dans quelques cas pour lesquels la suture bout-à-bout ne peut être réalisée d'une façon satisfaisante. On fait un rapide tour d'horizon sur ce sujet. Trente-deux cas consécutifs, opérés avec succès, sont rapportés.

## RESUMEN Y CONCLUSIONES

La anastomosis rectosigmoidea por invaginación es posible en algunos casos en los que no puede practicarse satisfactoriamente una sutura término-terminal. El autor presenta una breve exposición del tema, comunicando luego tres casos consecutivos satisfactoriamente tratados.

## RIASSUNTO

L'anastomosi retto-sigmoidea per invaginazione e' possibile in taluni casi, nei quali una sutura termino-terminale non puo' essere eseguita con sufficiente perfezione.

Descrive tre casi del genere, passando in rassegna la letteratura sull'argomento.

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# Repair of Single Cleft Lip by the Hagedorn-Le Mesurier Technic

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IN 1892 Hagedorn described a method of single cleft lip repair that has been overlooked in the passage of time. Le Mesurier has more recently revived the method, and its use has produced very gratifying results at this clinic.

The method may be used with equal success for complete and incomplete clefts, and we have found it highly satisfactory in secondary cleft lip repairs also. The advantages of the technic are that it (*1*) avoids the necessity of heavy skin sutures, (*2*) produces a more normal philtrum border, (*3*) eliminates an off-center scar, (*4*) equalizes the thickness of the mucous membrane, and (*5*) results in a more nearly normal cupid's bow.

*General Considerations.*—Though cleft lips are encountered and are satisfactorily repaired in patients of all ages, we feel that the earliest age at which repair can be carried out is best. Not only does the baby tolerate the operation well, but the mother is spared unduly prolonged heartache. If the baby is seen soon after birth, we prefer to operate after 6 to 10 days of life. However, the weight must be 6 pounds (2,721.5 Gm.) or more and the condition otherwise normal and healthy. If these conditions are not fulfilled we wait until the weight is 6 pounds and the baby is gaining at a normal rate. Early operation on babies with clefts in the alveolar ridge is especially indicated, because increasing calcification in the maxillae makes the moulding of the upper jaw and closure of the alveolar cleft by lip pressure much more difficult. If the operation is delayed too long, closure will not be accomplished and the subsequent palate repair is much more difficult.

*Preparation.* — For infants, paregoric or elixir phenobarbital is given in a regular feeding one hour before the operation.

*Anesthesia.*—Local anesthesia induced by a few drops of 0.5 per cent novocaine injected at each infraorbital foramen and at the base of the columella is usually sufficient for either infants or adults. Only for older children is general anesthesia occasionally used. In our opinion, general anesthesia is more dangerous for very young infants, especially when given by other than expert anesthetists. Under local anesthesia the infant retains his pharyngeal reflexes, and there is much less danger of aspiration or asphyxia.

## TECHNIC

The width of the normal side of the lip is used as a guide in determining the desired width of the cleft side (Fig. 1). A measurement is taken with calipers from the base of the normal nostril to a point ⅛ inch (0.32 cm.) from the vermilion border of the normal side. This measurment (*X-Y*) is used as a guide for the other measurements and the calipers are left at this setting (*1*, Fig. 1). Point *A* is located at the base of the affected nostril on the median side of the cleft. Point *B* is located on the vermilion border at *X-Y* distance from *A*. Point *C* is located in midline of the philtrum ⅛ inch (0.32 cm.) from the vermilion border. Point $A^1$ is located at the base of the affected nostril lateral to the cleft. Point $B^1$ is located ⅛ inch (0.32 cm.) from the vermilion border and *X-Y* distance from $A^1$ (*1* and *2*, Fig. 1).

With an 11 B-P blade an incision is made through the entire thickness of the lip along the vermilion border from *A* to *B*. Then the incision is extended from *B* to *C*. On the lateral side of the cleft an incision is made through the lip from $A^1$

From The Straith Clinic for Oral and Plastic Surgery, Detroit.

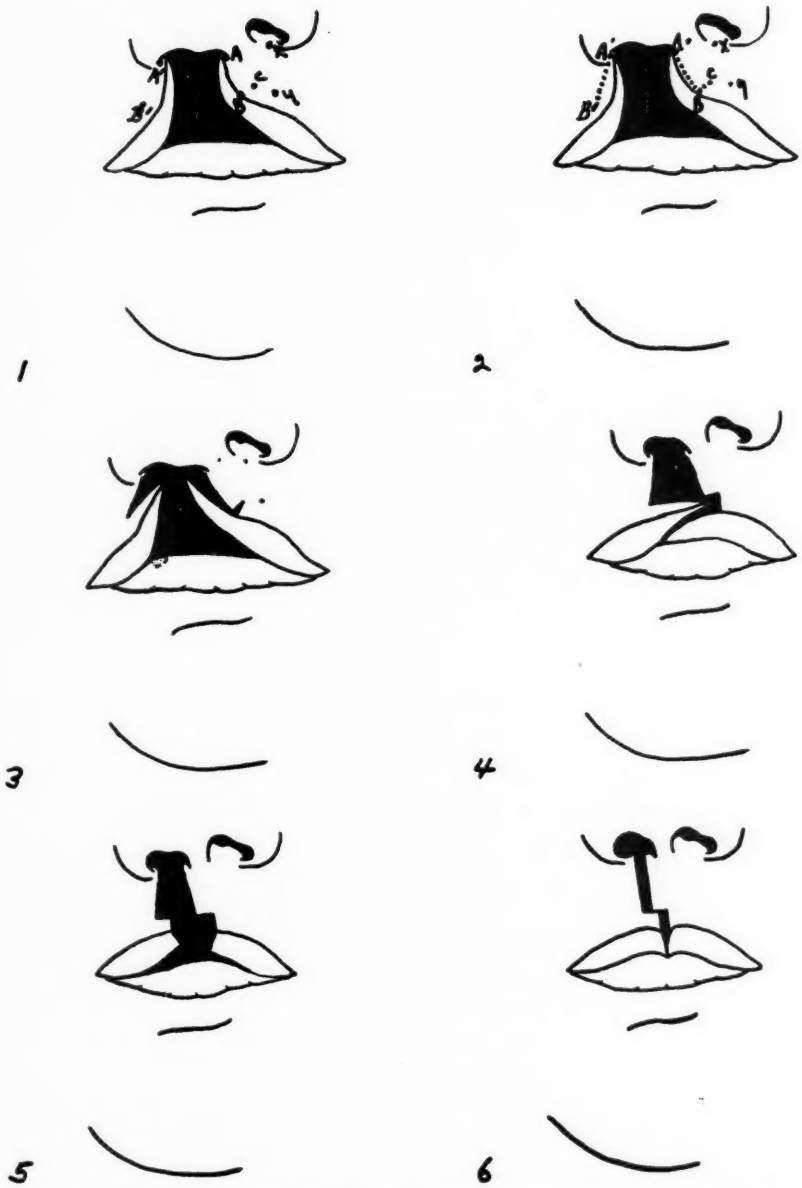


Fig. 1.—Hagedorn-Le Mesurier technic for repair of single cleft lip. *1*, orientation diagram (For location and explanation of points *A*, *B*, *C*, $A^1$, $B^1$, *X* and *Y*, see text.) *2* and *3*, incision made from *A* to *B* to *C* and from $A^1$ to $B^1$. *4* resulting flap of skin and mucous membrane lateral to the cleft, which is designed to fill the defect created on the medial side of the cleft. *5*, excess of skin and mucous membrane of the lateral flap and excess of mucous membrane of the medial flap excised. *6*, final plan of approximation. The vermilion border is carefully approximated and the mucous membrane everted as shown.

Fig. 2.—*Left*, preoperative appearance of complete unilateral cleft lip. *Right*, postoperative appearance.

Fig. 3.—*Left*, preoperative appearance of complete cleft lip. *Right*, appearance four weeks after the operation.

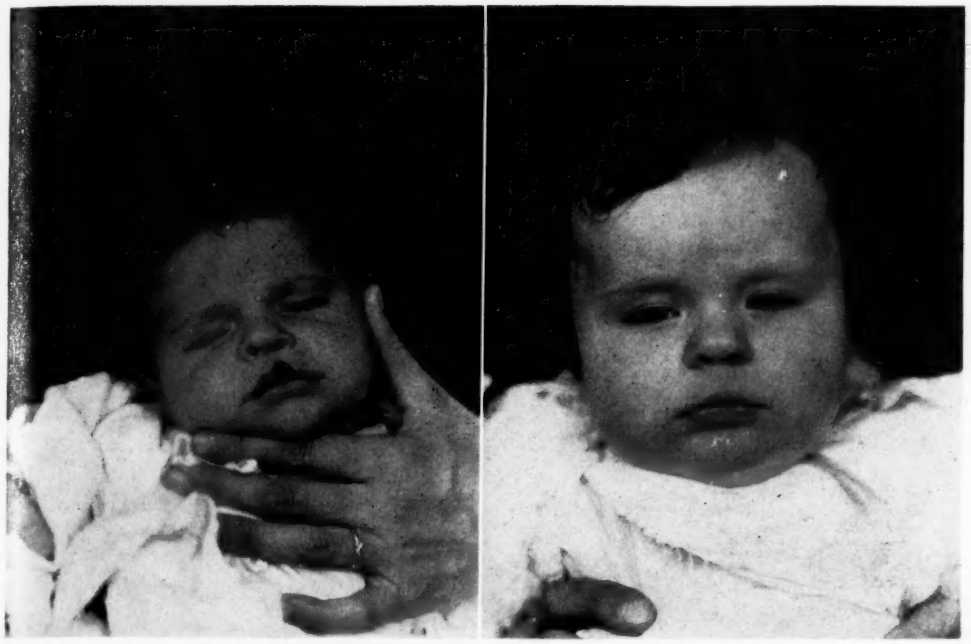

Fig. 4.—*Left*, incomplete cleft lip. *Right*, postoperative appearance.

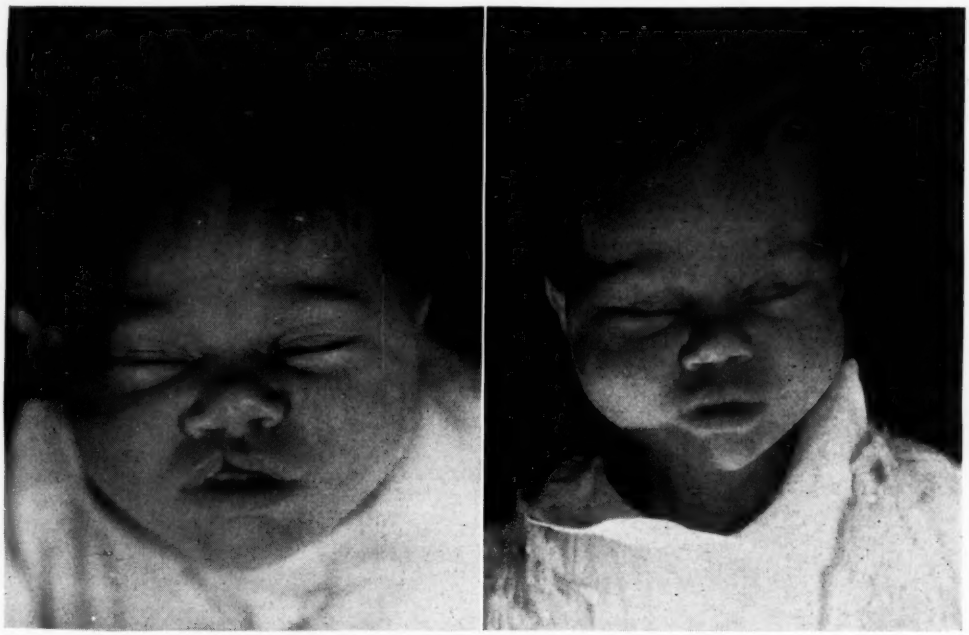

Fig. 5.—*Left*, incomplete cleft lip before operation. *Right*, postoperative appearance.

Fig. 6.—*Left*, incomplete cleft in older child. *Right*, appearance eight weeks after the operation.

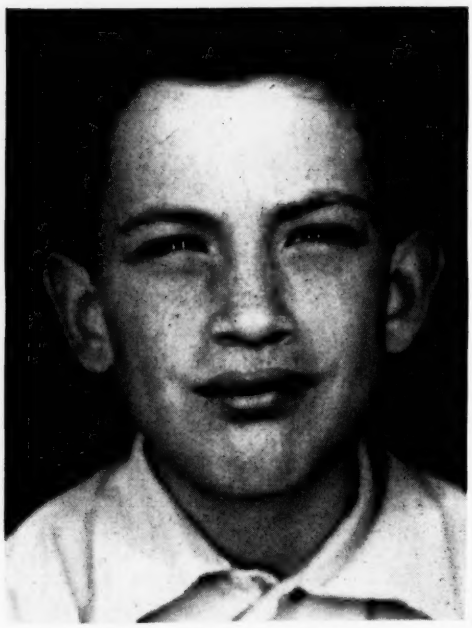

Fig. 7.—Close-up view of lip.

to $B^1$ (*2* and *3*, Fig. 1). Even if the cleft is incomplete the incisions are carried up into the floor of the nostril, as it is nearly always too wide on the side of the cleft, and there is a dehiscence of the muscle making a groove in the skin above the cleft (Figs. 6 and 7).

The lip is freed from the maxilla in order to mobilize it and prevent tension on the suture line. Adequate mobilization is important both for the lip and for the ala. Next, a small step that is more important than its simplicity suggests is the splitting of the cut edges of the lip slightly, to insure eversion of the skin edges.

The cut edges are now brought together by hooks to provide a preview of the repaired lip (*4*, Fig. 1). Usually there will be noted a wider nostril base on the cleft side, necessitating further excision at that point.

Three figure-of-eight sutures of 4-0 nylon (2-0 nylon may be used for adults) are introduced from beneath the lip to relieve tension and are tied under the lip.

Then the flaps are fitted together as shown in *5* and *6*, Figure 1, the excess being cut off so as to leave the lower end of the scar in the midline. Often a small triangle of skin at *B-C* must be excised along with the mucous membrane to make the line of suture perpendicular in the midline. A

Fig. 8.—*Left*, incomplete cleft of lip. *Right*, postoperative appearance.

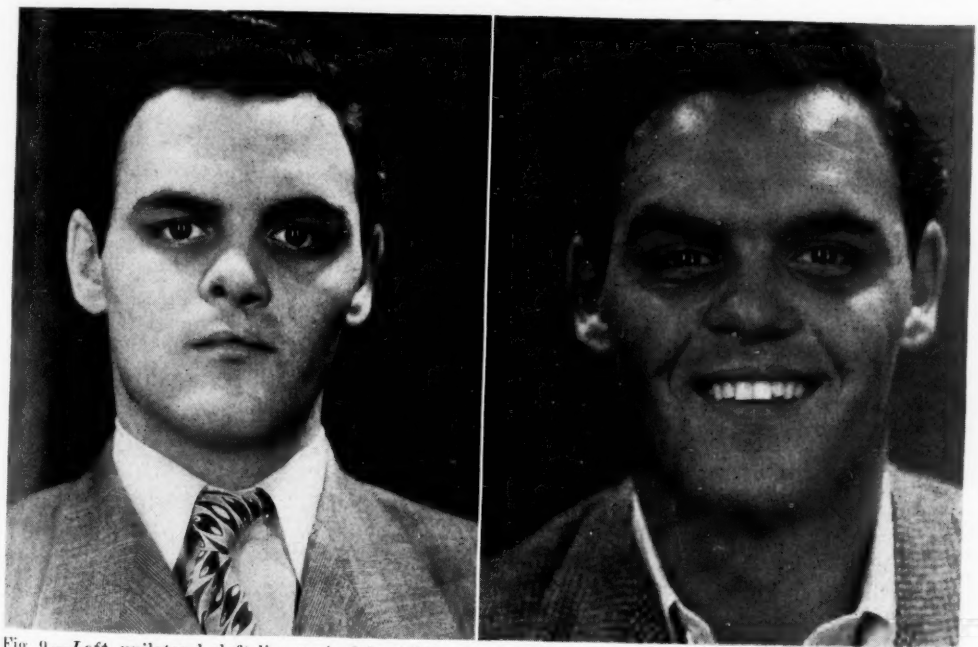

Fig. 9.—*Left*, unilateral cleft lip repaired in childhood, revealing asymmetry of nostrils and notching of red border. *Right*, postoperative result.

Fig. 10.—*Left*, unilateral cleft lip repaired at the age of 28. *Right*, immediate postoperative result of secondary repair by the Hagedorn-Le Mesurier technic. Subcuticular sutures were used in the upper part of the wound.

small amount of excess mucous membrane is left on each flap and is everted in order to finish the cupid's bow in the midline (*6*, Fig. 1). The skin is closed with interrupted sutures of 8-0 black silk and the mucous membrane with horsehair or nylon.

Since the lip of the shorter side of the cleft is usually thicker, an ellipse of mucous membrane is excised from the under surface to equalize the two sides.

A Logan traction bow is applied for further relief of the tension on the skin sutures. No dressing is applied; therefore the lip may be cleaned as often as necessary with hydrogen peroxide or boric acid solution. Penicillin ointment applied over the lip often prevents crusting.

One half of the skin sutures are removed in two or three days and the remainder in four to five days. The mucous membrane sutures are removed in one week, and the nylon figure-of-eight sutures and the Logan traction bow are removed in ten days to two weeks.

Examples of different types of left lips required by this technic are shown in Figures 2 to 9 inclusive.


## SUMMARY

The Hagedorn cleft lip technic as revived by LeMesurier is described, and some results are shown. The technic has been used almost exclusively in this Clinic for the past three years, and in our opinion it gives more consistently good results than does any other. The advantages, as we see them are that it (*1*) avoids the need of heavy skin sutures; (*2*) produces a more nearly normal philtrum border; (*3*) eliminates an off-center scar; (*4*) equalizes the thickness of the mucous membrane, and (*5*) results in a cupid's bow approximating the normal.

## RÉSUMÉ

La technique de Hagedorn pour la fente labiale telle qu'elle fut ressuscitée par Le Mesurier, est décrite, et on montre quelques résultats. Cette technique a été employée presque exclusivement dans la Straith Clinic durant ces trois dernières annés, et dans l'opinion des auteurs elle donne des résultats plus constants que n'importe quel autre. Ses avantages sont que: (1) elle évite de faire de grosses sutures de la peau (2) elle produit une bordure presque normale de la lèvre supérieure; (3) elle supprime l'escharre en dehors de la partie centrale; (4) elle égalise l'épaisseur de la membrane muqueuse et (5) les résultats du dessin de l'arc de Cupidon approchent de la normale.

## RIASSUNTO

Descrive la tecnica operatoria di Hagedorn, riesumata da Le Mesurier, per la cura del labbro leporino. Quest'operazione e' stata sempre adottata—durante gli ultimi tre anni—nella clinica diretta dall'A., perchè offre in

confronto alle altrem operazioni i seguenti vantaggi:

1) Evita la necessita' di robuste suture cutanee.

2) Conduce alla formazione di un margine quasi normale del solco infranasale.

3) Elimina l'inconveniente di una cicatrice deviata dalla linea mediana.

4) Uniforma lo spessore della mucosa.

5) Ripristina in modo quasi perfetto l'arco di cupido.

RESUMEN

Se describe la técnica de la Mesurier para tratar el labio leporino presentándose los resultados obtenidos en algunos casos. Esta técnica se ha empleado casi exclusivamente en la clínica Straith, durante los últimos tres años y a juicio del escritor ha dado resultados favorables de un modo más consistente que ninguna otra técnica. Las ventajas de la misma son: (1) elimina la necesidad de suturas cutáneas gruesas; (2) deja un borde del surco medio en el labio superior más similar al normal; (3) elimina una cicatriz desviada del centro; (4) nivela el espesor de la membrana mucosa; (5) determina una configuración del arco de cupido más parecida a la normal.

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# Treatment of Achalasia: Transthoracic Approach

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THE subject of achalasia is by no means new. The term refers to a functional derangement of the lower part of the esophagus with dilatation of the upper part and delayed passage or retention of food. It has been described under various terms, such as cardiospasm, ectasia, idiopathic dilatation of the esophagus, paralytic dilatation of the esophagus, and mega-esophagus (comparable to the term megacolon). References were made to this subject as far back as 1674, when various instruments were devised to dilate the lower end of the esophagus as it enters the stomach. Achalasia is observed rather frequently and is secondary only to carcinoma of the esophagus as a cause of difficulty in swallowing. According to Scheibel, 17.8 per cent of all esophageal lesions are due to achalasia. The subject becomes extremely important, since differential diagnosis from carcinoma of the esophagus must be made.

## ETIOLOGY

The cause of achalasia is not definitely understood, but is more or less accepted as neurogenic. It is our opinion that the condition is the result of degeneration or destruction of the ganglions and connecting fibers of Auerbach's plexus, producing a loss of coordination in the circular muscle fiber action of the various segments of the esophagus and manifesting itself chiefly by constriction of the circular muscle fibers in the lower fourth of the esophagus and dilatation of the upper two thirds. The actual destruction of ganglions and connecting nerve fibers of Auerbach's plexus and the loss or absence of ganglion cells of the myenteric plexus have not been proved pathologically, as the work on this problem is not yet complete. Etiologically the condition is comparable to pyloric stenosis, in which there is marked hypertrophy of the circular muscle fibers; and in keeping with the recent and excellent work of Swenson of Boston (*Congenital Megacolon*) it is our impression that achalasia and this condition are likewise comparable. In Swenson's interpretation, congenital megacolon resembles a chronic obstruction with subsequent dilatation of the colon resulting from constriction of the circular muscle fibers in the rectosigmoid segment, and in achalasia an identical condition occurs as a result of constriction of the circular muscle fibers in the lower fourth of the esophagus. The esophageal hiatus of the diaphragm plays no part in this condition, and a diaphragmatic pinchcock mechanism does not exist in many cases. In the 4 cases presented in this paper the circular muscle fibers of the lower fourth of the esophagus all showed marked hypertrophy, and in 1 case there actually existed a bulb formation, similar to that observed in pyloric stenosis, made up completely of circular muscle fibers.

## SIGNS AND SYMPTOMS

1. Pain. This symptom is present in 60 to 70 per cent of the cases, in sharp contrast to its absence in cases of carcinoma. The pain may occur at any time during the day or night and is not especially related to eating. It is retrosternal and may radiate into the cervical region at the angle of the jaw and the mastoid region. It may be felt in the epigastrium, or it may be felt in the back at the level of the tenth, eleventh, and twelfth thoracic vertebrae.

2. Dysphagia. The patient complains of marked difficulty in swallowing food, frequently stating that fluids can be ingested, but that no solid food will pass. The reverse is also described at times.

3. Regurgitation of food.

4. Loss of weight.

5. Inability to take cold foods and cold drinks.

Read at the Fourteenth Annual Assembly of the United States Chapter, International College of Surgeons, Atlantic City, N. J., November 1949.

## METHODS OF TREATMENT

In 1914 methods were described by Heller of dividing the musculature anteriorly and posteriorly permitting the mucosa to remain intact, as for pyloric stenosis. This was done by the subdiaphragmatic route. In 1910 Heyrovsky described a successful side-to-side anastomosis between the esophagus and the cardia of the stomach. Esophagogastrostomy by the subdiaphragmatic route has brought about excellent results.

*Indications for Surgical Treatment*—Operation is indicated as follows:

1. When roentgen examination discloses that, because of increased length of the esophagus with a sigmoid or a flank-shaped contour, dilation is difficult and dangerous and must be kept up more or less continuously.

2. When the patient, under proper care as to rest and type of food, is reasonably free from emotional exacerbations, but requires frequent dilations (once a week or several times a month).

3. When the patient is geographically or financially unable to have frequent dilations.

4. When the patient does not tolerate the procedure and because of fear and pain is unable to learn the use of bougies even with medical aid.

5. When all methods of conservative treatment have failed and all attempts to eradicate emotional stress and strain have been unsuccessful, the patient being still unable to swallow, still in pain and still losing weight. Surgical intervention under these circumstances should be planned according to the best judgment of the operating surgeon.

## REPORT OF CASES

Four patients have been operated on by me for achalasia. The transthoracic approach through the ninth rib has been used in each case. All patients whose cases are presented here have been treated conservatively; in 2 cases dilation was performed, and in 2 it was rejected. Retrosternal pain, dysphagia, regurgitation and loss of weight were present in every case.

CASE 1.—Mr. M. C., aged 42, was admitted to the West Penn Hospital Dec. 12, 1948. A diagnosis of achalasia had been made previously in one of the clinics, based on the patient's inability to swallow. The patient had sustained an injury two years previously, when he was struck in the right side of the chest causing the fracture of two ribs. Three months later he noticed difficulty in swallowing. Complete obstruction was never present; as the patient could swallow liquids, but total obstruction existed as far as solid foods were concerned. There was also a history of domestic difficulties which caused the patient considerable worry. Three months after the onset he was studied in one of the outstanding clinics. A diagnosis of achalasia was made, and dilation was performed. Relief was obtained and lasted seven to eight months. The patient was not able to take solid foods well; he had lost weight up to 30 pounds (14.1 Kg.). He was admitted to the West Penn Hospital Dec. 12, 1948. Roentgenograms were taken and revealed a smooth olive-tip type of obstruction in the lower fourth of the esophagus, with dilatation of the esophagus above this point. The roentgen films also revealed the possibility of a small diverticulum, which made dilation somewhat hazardous. In spite of this, dilation was advised and antispasmodics were administered, but the patient stated that he had "been on a trial period" of such treatment previously without any success. He further stated that he preferred surgical operation.

The other outstanding features in this case were auricular fibrillation and some dilatation of the left auricle, which added to the hazards of the operation. The patient was prepared for operation with proper fluids and supportive measures, and on December 16 the left side of the chest was opened through the ninth rib and the lower end of the esophagus was exposed. Approximately 1 inch (2.5 cm.) above the hiatus was a bulbous formation made up of hypertrophied circular muscle fibers. In this case, as in all the others, the stomach was opened and a finger inserted into the esophagus to rule out any intraesophageal lesion. The hypertrophied circular muscle fibers were divided through the thickened portion anteriorly, and the incision was carried to the cardiac end of the stomach, the mucosa being permitted to bulge forth freely. After the operation the patient made an uneventful recovery except for mild cardiac decompensation, which was controlled by digitalis and quinidine. Solid food was taken on the sixth day, and up to the time of writing there has been no further difficulty in swallowing. Roentgenograms taken Jan. 3, 1949, revealed the obstruction to be relieved. Additional films, which will be shown later, taken March 11, also revealed no obstruction.

CASE 2.—This case is extremely interesting and was the first of the series. Mrs. K. S., a woman aged 62, had difficulty in swallowing dating back to

March 1945. Roentgenograms taken at this time revealed marked constriction and obstruction in the lower fourth of the esophagus. Dilations were attempted to relieve the difficulty, without success. Biopsy specimens were taken, which showed normal esophageal mucosa. Since no relief was obtained, a gastrostomy was performed in April to permit nutrition. Further dilations were attempted in the rest of the esophagus without success, and the patient was discharged from the hospital, having been fed with a gastrostomy tube. She was readmitted to the West Penn Hospital on November 8 because the gastrostomy tube was not functioning normally and the skin about the abdomen had become markedly macerated and ulcerated. It was assumed at this time that the diagnosis was carcinoma of the esophagus with marked loss of weight and that a change in the gastrostomy tube would afford the patient more comfort. On November 10 a new gastrostomy opening was made, the former one being permitted to heal. After this procedure the patient gained considerable weight, out of all proportion for a patient with carcinoma. Examination of the esophagus, therefore, was again attempted without success, and the patient was sent home with her new gastrostomy site. Roentgenograms of the esophagus still revealed obstruction. By March 1946 the patient had gained considerably and was feeling better, but was willing to accept any surgical procedure that would give her relief. On April 4, after satisfactory preparation, a transthoracic exploration was done through the left side of the chest at the ninth rib. There was no evidence of tumor in the lower end of the esophagus, and the organ was again explored by insertion of a finger through the stomach side. The circular muscle fibers in this case were not hypertrophied as much as in the previous case. A similar procedure was done, dividing the circular muscle fibers from 1½ inches (3.7 cm.) above the diaphragm to the cardiac end of the stomach. The patient made an uneventful recovery and swallowed well from that time. The gastrostomy was closed sixteen days later and has not been necessary since. On two occasions the patient has been admitted for three or four days because of fear that her condition was recurring. However, under reassurance she swallowed with ease, and roentgen examination revealed no appreciable amount of obstruction. The course was favorable until September 1948, at which time the patient was struck by an automobile and sustained an injury to both costal regions. One week later she went into total obstruction as far as the esophagus was concerned. She did not respond to antispasmodics, and she refused instrumental dilations. Operation seemed inevitable. A small incision was made in the upper portion of the abdomen. The stomach was opened and a finger inserted through the cardioesophageal opening. A marked fibrosis had developed which had practically closed it, but by finger dilations the constriction was separated easily and quickly. The patient has had no further difficulty in swallowing.

CASE 3.—Mrs. L. I., aged 66, was admitted to the West Penn Hospital Jan. 5, 1947, with the complaint of vomiting and inability to swallow for the past four months. A marked loss of weight had occurred, and the patient had a pronounced and annoying cough. Her general condition was not good. Roentgenograms revealed an obstruction at the lower end of the esophagus, highly suggestive of carcinoma, and the patient's cachectic appearance also suggested it. Esophageal examination was not done in this case because of the patient's refusal. It had been attempted in the hospital prior to the present admission. In view of this and after adequate preparation, the patient was operated on four days after admission to the hospital. The left side of the chest was opened through a transthoracic exposure. There was no evidence of carcinoma, and the lumen of the esophagus was patent. The esophagus was dilated. The muscle fibers in the lower fourth again were thickened but did not present a bulbous tumor mass like that which had been present in the first case. Again the circular muscle fibers were divided longitudinally, the mucosa being permitted to bulge through, and the patient made an uneventful recovery. Solid food was taken on the seventh day, and there has been no difficulty in swallowing to date. Roentgen films of the esophagus taken approximately sixteen days after the operation showed some delay in the region of the aortic arch, which is a frequent and well known condition, and only a slight amount of delay affected the stomach. This patient was reexamined roentgenographically on March 11, 1949, and the barium passed with comparative ease. At the time of writing she has no difficulty in swallowing.

CASE 4.—Mr. R. M., aged 75, was admitted to the West Penn Hospital Jan. 12, 1947. His chief complaint was that of delay in the passage of food to the stomach, associated with a corresponding weight loss. Roentgenograms that accompanied the patient revealed constriction and obstruction of the lower fourth of the esophagus. Esophagoscopic study revealed no gross evidence of malignant change. There was difficulty in entering the stomach, but with force a bougie was introduced. Although biopsy gave negative results, malignant disease was suspected because of the patient's age, and he was subjected to a transthoracoabdominal exploration through the ninth rib. No evidence of malignant change was found. There was no constric-

tion at the hiatus. The muscle fibers were hypertrophied, as in the preceding cases, and the same operative procedure was performed. After the operation the patient made an uneventful and reasonably good recovery considering his age. He was discharged from the hospital thirty days after the operation. He did not return at any time to the hospital for check roentgenograms. On March 10, 1949, roentgenograms were taken outside the hospital and showed some degree of delay in emptying, but clinically the patient had no difficulty in swallowing two years and ten months after the operation.

SUMMARY

1. Certain general aspects of achalasia are discussed.

2. The causative mechanism of achalasia is doubtless neurogenic. The pathologic process involves the lower fourth of the esophagus, causing constriction of the circular muscle fibers, and is due to degeneration of Auerbach's and the myenteric plexus resulting in loss of coordination of the neural mechanism.

3. The condition, in our opinion, is comparable to pyloric stenosis and congenital megacolon.

4. All methods of treatment have been taken into consideration. Conservative treatment with dilation should be the first choice. Esophagogastrostomy has had many good results; however, if the plans outlined in this paper are correct, recurrences are apt to occur from repeated constriction of the circular muscle fibers of the lower fourth of the esophagus. Cardioesophageal side-to-side anastomosis should be effective, because in this procedure the circular muscle fibers are divided in performing the anastomosis, but the operation is more hazardous than the method described.

5. The transthoracic approach with division of the circular muscle fibers over the lower fourth of the esophagus, permitting the mucosa to bulge, has been performed on 4 patients varying in age from 42 to 75.

6. The left transthoracic approach has been adopted because of the ease of operation and because it affords visualization of the esophagus to such an extent that any additional lesion can be recognized. By the subdiaphragmatic route, with the same plans, it is thought that sufficient division of the circular muscular fibers cannot be accomplished.

7. Carcinoma of the esophagus can easily be confused with achalasia.

8. Dilatation in the proximal three-quarters of the esophagus is not corrected owing to loss of tone from degeneration of the nerve fibers and ganglions, and the peristaltic effect of the esophagus is lost in favor of a gravity mechanism.

RÉSUMÉ

1. On discute de certains aspects généraux d'achalasie.

2. La cause de l'achalasie est sans doute neurogénique. Le processus pathologique atteint le quart inférieur de l'œsophage, provoquant la contraction des fibres du muscle circulaire et ce processus est causé par la dégénérescence du plexus d'Auerbach et du plexus myentérique qui est le résultat du manque de coordination du mécanisme nerveux.

3. Cet état, à notre avis, est comparable à une sténose du pylore et à un mégacolon congénital.

4. Toutes les méthodes de traitement ont été prises en considération. Le traitement conservateur avec dilation devrait être le premier choisi. L'œsophagogastrostomie compte à son actif beaucoup de bons résultats; cependant, si les données contenues dans cet article sont correctes, des rechutes peuvent survenir en raison de la contraction répétée des fibres du muscle circulaire de la quatrième portion de l'œsophage inférieur. L'anastomose latérale cardio-œsophagienne devrait être efficace parce que les fibres du muscle circulaire sont divisés lorqu'on fait cette anastomose, mais l'opération comporte plus d'aléas que la méthode décrite.

5. L'abord transthoracique, en séparant les fibres du muscle circulaire au dessus de la quatrième partie de l'œsophage inférieur, permettant la saillie de la muqueuse, a été réalisé sur quatre malades dont l'âge variait de 42 à 75 ans.

6. On avait adopté la voie d'abord transthoracique gauche pour la facilité de l'opération et parce que cette voie permettait une vue directe de l'œsophage d'une étendue telle qu'on pouvait déceler toutes lésions surajoutées. Par la voie sousdiaphragmatique avec les mêmes données, nous pensons qu'une séparation suffisante des fibres du muscle circulaire ne peut pas être effectuée.

7. On peut confondre aisément le carcinome de l'œsophage avec l'achalasie.

8. La dilation dans les trois quarts proximaux de l'œsophage ne peut être corrigée sans provoquer une perte de la tonalitée due à la dégénérescence des fibres et des ganglions nerveux. La fonction péristaltique de l'œsophage est remplacée par un mécanisme de progression due à l'action de la pesanteur.

RESUMEN

1. Se estudian ciertos aspectos de la acalasia.

2. El mecanismo causal de la acalasia indudablemente es neurológico. El proceso patológico afecta el cuarto inferior del esófago, causando una constricción de las fibras musculares circulares, originada por una degeneración de los plexos de Auerbach y mesentéricos, que determinan la pérdida de la coordinación de los mecanismos neurales.

3. El proceso es comparable a la estenosis pilórica y al megacolon congénito.

4. Se han considerado todos los métodos de tratamiento. El tratamiento conservador con dilatación debe ser el preferible. La esofagogastrostomía ha dado muy buenos resultados: pero si las opiniones expresadas en esta comunicación son exactas, es fácil que se presenten recaídas como resultado de la constricción repetida de las fibras musculares circulares del cuarto inferior del esófago. La anastomosis cardioesofágica látero-lateral debe ser efectiva en este caso, ya que en este procedimiento las fibras musculares circulares quedan seccionadas al realizar la anastomosis, pero la operación es más arriesgada que el método descrito.

5. Se ha utilizado en 4 pacientes cuyas edades variaban de 42 a 75 años la via transtorácica con sección de las fibras musculares circulares sobre el cuarto inferior del esófago, permitiendo la hernia de la mucosa.

6. Se ha adoptado la vía transtorácica izquierda, por la facilidad de la operación y porque proporciona una visualización del esófago de tal grado, que permite reconocer cualquier otra lesión adicional. Se considera que utilizando la vía subdiafragmática con los mismos planos, no puede realizarse una sección suficientemente completa de las fibras musculares circulantes.

7. El carcinoma del esófago puede confundirse fácilmente con la acalasia.

8. No se corrige la dilatación de los tres cuartos proximales del esófago por la pérdida de tono muscular producida por la degeneración de las fibras y gánglios nerviosos, perdiéndose el efecto propulsor del esófago y actuando en su lugar el mecanismo de la fuerza de gravedad.

RIASSUNTO

1) Considerazioni generali sopra l'acalasia e relativa discussio-ne.

2) Il meccanismo di origine e' indubbiament nervoso. Processi degenerativi del plesso di Auerbach e del plesso mienterico condùcono ad un'incoordinazione del meccanismo nervoso, con una costrizione progressiva delle fibre muscolari ad anello.

3) Si viene in tal modo a creare una condizione paragonabile alla stenosi pilorica od al megacolon congenito.

4) Per quanto riguarda la cura, la preferenza va naturalmente data—all'inizio—alla dilatazione pura e semplice dell'esofago.

L'esofagogastrostomia ha condotto a dei buoni risultati: ma se il meccanismo d'origine dell' acalasia e' quale e' stato ammesso dall'A., e' inevitabile che delle recidive debbano ricorrere per una costrizione ripetuta delle fibre muscolari del quarto inferiore dell'esofago. L'anastomosi laterale cardio-esofagea dovrebbe condurre a migliori risultati, poiche' nell'eseguire l'anastomosi le fibre circolari della muscolatura esofagea vengono interrotte. Ma l'operazione e' piu' pericolosa di quella descritta dall'A.

5) In quattro casi, la cui eta' ha oscillato da 42 a 75 anni, l'A. ha proceduto per via transtoracica alla divisione delle fibre muscolari circolari nel quarto inferiore dell'esofago, in modo da provocare una protrusione della mucosa.

6) Ha preferito la via transtoracica sinistra per la maggiore facilita' di esecuzione e perche' consente una piu' larga esposizione dell'esofago qualora esistano delle lesioni concomitanti. La divisione delle fibre muscolari dell'esofago per via sottodiaframmatica non e' possibile.

7) L'acalasia puo' essere facilmente confusa con un carcinoma.

# Fracture of the Spine

## New Treatment Without Plaster Casts

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THE modern trend in surgery is to make the patient ambulatory as soon as possible. There are distinct limitations to this practice, but generally it has proved to have great advantages over the older practice of prolonged postoperative bed rest.

In the October 1937 issue of the *Journal of Bone and Joint Surgery* I described a light hyperextension back brace which I was using successfully in the treatment of fractured spines. Many of our patients in Florida are in the geriatric group and cannot well tolerate large plaster casts, especially during the warm months of the year.

From 1936 to 1942 I used the aforementioned brace on most of my patients with fractured backs. The patient was put to bed in gradually increasing hyperextension on a modified Bradford frame, a Herzmark frame or a reversed Gatch bed with the knee elevation coming up under the lower part of the back. After a period varying from a few days to a few weeks, when the hyperextension had produced adequate reduction of the compression fracture, the patient was taken to the operating room and two plaster hyperextension casts were applied in the usual manner. Anesthesia, either general or local, was employed but seldom.

The first plaster cast was immediately removed and bound together to act as a model for the brace. The other cast was then applied, and when it was dry the patient was made ambulatory. He wore his cast until the brace was ready, which usually took about a week. After this the cast was removed and the brace worn until healing of the fractured vertebral body was complete. The advantages of a 2-pound (0.9 Kg.) well-ventilated back brace over a much heavier hyperextension plaster cast are obvious.

At this point it may be well to point out the difference between a hyperextension brace of the aforementioned type and the ordinary back brace of the two-bar or the four-bar variety, called by the names of their originators, Taylor, Knight and others. The principle of the hyperextension brace is that of a bow, a seesaw and many similar adaptations in the realm of engineering construction. When the patient wearing this brace bends forward or sits down there is no alteration in the hyperextension of the spine, as firm metal fixation holds the symphysis, the sternum and the lumbar portion of the spine in their normal interrelations.

The principle of the Taylor brace is exactly the reverse. There is only one supposedly fixed point, the pelvic girdle; the rest of the spine has to be supported from this one area by the posterior metal bars. No matter how well such a brace is applied, when a patient bends forward the dorsal part of the spine will almost invariably pull away from the top of the brace. Also, the burden of support for the upper part of the spine generally is borne by shoulder straps or pectoral pads, the anchorage again being transmitted down to the pelvic girdle. Every surgeon is aware of the difficulties of hyperextending a spine adequately with this type of brace. Personally, I do not think it can be done, and I have never seen one applied that could satisfactorily maintain the marked hyperextension that is mandatory in many cases of fractured spine. Another point in favor of the hyperextension brace is that no perineal straps are needed.

Soon after coming out of the Naval Reserve Service in January 1946 I had an elderly patient, a woman, with a fracture of the second lumbar vertebral body. I treated her as I have described, obtaining the desired hyperexten-

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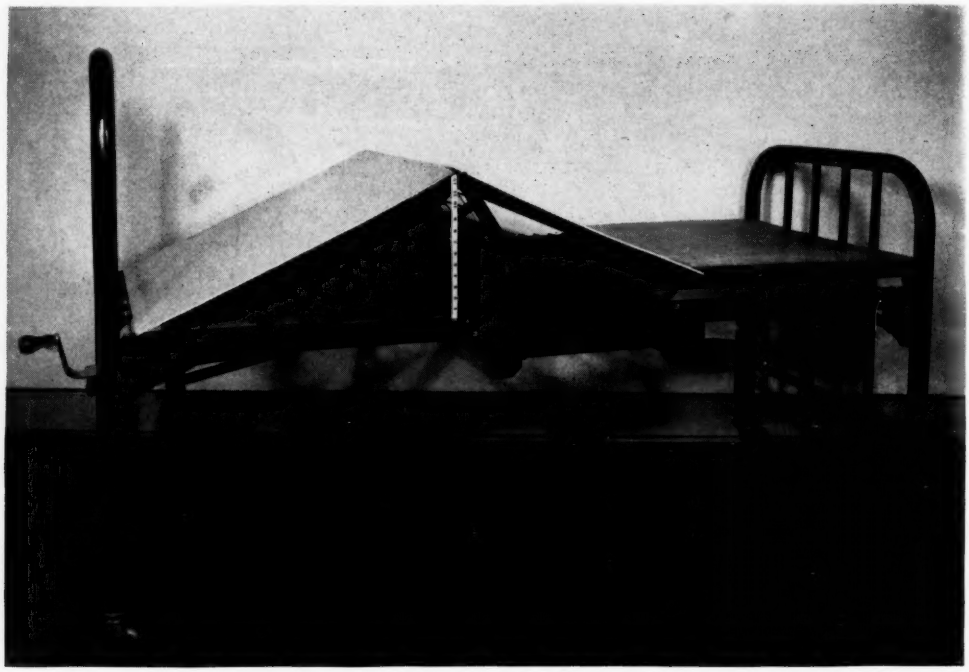

Fig. 1.—Ordinary hospital bed with maximum elevation of 12 inches (30.4 cm.) from bed level.

sion with the reversed Gatch bed, but she had a very rough time in the operating room when I was putting on those two casts. In addition to the fact that she was obese, her cardiac status for several years had been precarious. The next day, while walking about her room, she had a cardiac accident and was put to bed by her cardiologist. She died about five days later without becoming ambulatory again. In reviewing this case I decided there must be a way of eliminating the stress and strain involved in taking the patient into the operating room and of applying these plaster casts with the patient on a hyperextension frame, a sling or some similar apparatus.

Since that time, all of my patients with fractured spine requiring hyperextension have been placed with their heads toward the foot of an ordinary hospital bed. Adequate reduction can be obtained in almost every instance by gradually raising the Gatch bed under the lumbar portion of the spine. More elevation can be obtained by placing boards across the bed; if they are fastened together at the top of the Gatch part, an acute angle can be obtained. Adequate hyperextension even of the lower part of the dorsal area can be procured without putting the apex of the angle directly under this region.

In order to prevent the patient from sliding either downward or upward, low shock blocks at either end of the bed are often needed. Of course, the usual precautions must be taken to make sure that the patient will not raise his shoulders or his buttocks from the bed. A small pillow under the head or pillows under the knees may be permitted, and, of course, the patient can turn from side to side with hyperextension still adequately maintained.

It is not within the scope of this article to discuss the medical care of the patient, which is an established routine familiar to all.

As soon as the patient is put to bed he is measured for a hyperextension back brace. With our brace men, Mr. Dan Blair of Atlanta and Mr. Robert Blair of Orlando, a plan was

*Data on 58 Consecutive Cases of Compression Fracture of Spine*

| Patient | Sex | Age | Occupation | Cause | Date of injury | Area | Seen after trauma | Time on Gatch bed | Full time in brace | Part time in brace | Follow-up after trauma | Result |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S.C. | M | 39 | Linesman | Fall | 1-16-46 | D-9 | 1 hr. | 7 da. | 12 mo. | 12 mo. | 32 mo. | Good |
| E.W. | F | 18 | Office | Auto | 1-30-46 | L-1-2 | 1 hr. | 3 mo. fr. pel. | 5 mo. | 3 mo. | 31 mo. | Excellent |
| E.W. | F | 18 | School | Auto | 3- 6-46 | L-1-2-3 | 2 wk. | 4 da. | 7 mo. | 1 mo. | 29 mo. | Excellent |
| E.W. | M | 47 | Salesman | Fall | 3-14-46 | L-1 | 3 hr. | 5 da. | 6 mo. | 1 mo. | 29 mo. | Excellent |
| A.R. | F | 16 | School | Fall | 6-14-46 | D-6-7-8 | 7 da. | 5 da. | 9 mo. | 3 mo. | 26 mo. | Excellent |
| O.L. | M | 38 | Flier | Plane | 6-29-46 | D-12 | 2 wk. | 6 da. | 6 mo. | 2 mo. | 26 mo. | Excellent |
| A.C. | F | 19 | School | Diving | 6-29-46 | D-11 | 2 wk. | 7 da. | 6 mo. | 2 wk. | 26 mo. | Excellent |
| O.S. | F | 76 | Housewife | Fall | 8- 2-46 | L-2 | 1 hr. | 5 da. | 7 mo. | 3 mo. | 24 mo. | Excellent |
| M.K. | F | 68 | Housewife | Fall | 9- 2-46 | L-1 | 6 wk. | 6 da. | 6½ mo. | 0 | 23 mo. | Excellent |
| W.R. | M | 46 | Flier | Plane | 10-15-46 | D-12 | 2 mo. | 0 | 8 mo. | 4 mo. | 22 mo. | Good |
| A.C. | F | 46 | Saleswoman | Fall | 12- 3-46 | D-8 | 2 hr. | 3 wk. | 6½ mo. | 2 mo. | 20 mo. | Good |
| J.I. | M | 77 | Retired | Fall | 12- 3-46 | D-12-L-1 | 3 hr. | 2 wk. | 7 mo. | 5 mo. | 20 mo. | Excellent |
| E.M. | F | 76 | Housewife | Fall | 12-17-46 | L-1 | 3 da. | 5 mo.; tumor | 26 mo. | 0 | 19 mo. | Good |
| J.I. | M | 32 | Flier | Plane | 12-23-46 | L-5 | 1 da. | 10 da. | 6 mo. | 2 mo. | 19 mo. | Excellent |
| M.M. | F | 63 | Housewife | Fall | 1-10-47 | L-2 | 4 da. | 2 wk. | 6 mo. | 2 mo. | 19 mo. | Excellent |
| M.F. | F | 63 | Housewife | Fall | 1-14-47 | L-2 | 4 hr. | 1 wk. | 5 mo. | 1 mo. | 19 mo. | Excellent |
| E.A. | M | 17 | School | Fall | 2- 9-47 | L-2 | 8 hr. | 4 da. | 5 mo. | 1 mo. | 18 mo. | Excellent |
| C.Y. | M | 18 | School | Motorcycle | 2-11-47 | D-11-12 | 2 hr. | 4 mo. fr. fem. | 3 mo. | 2 mo. | 18 mo. | Excellent |
| W.K. | M | 53 | Electrician | Fall | 3-21-47 | D-12 | 2½ wk. | 6 da. | 6 mo. | 3 mo. | 17 mo. | Good |
| J.W. | M | 49 | Business | Fall | 4- 6-47 | L-3 | 0 | 5 wk. | 7 mo. | 0 | 17 mo. | Excellent |
| W.J. | F | 56 | Housewife | Fall | 4-21-47 | D-12 | 10 da. | 10 da. | 5½ mo. | 2 mo. | 15 mo. | Excellent |
| M.S. | F | 55 | Housewife | Fall | 5-14-47 | L-1-2 | 1 hr. | 4 da. | 6 mo. | 1 mo. | 15 mo. | Excellent |
| N.H. | M | 27 | Builder | Diving | 6- 8-47 | D-1-4 | 1 hr. | 8 da. | 5 mo. | 0 | 14 mo. | Excellent |
| J.F. | F | 65 | Housewife | Fall | 6-10-47 | D-11-L-1 | 1 mo. | 4 da. | 9 mo. | 0 | 14 mo. | Good |
| N.S. | F | 70 | Housewife | Fall | 6-25-47 | D-11 | 1 da. | 7 da. | 6 mo. | 2 mo. | 14 mo. | Excellent |
| B.D. | F | 53 | Housewife | Fall | 7-10-47 | D-11 | 3 mo. | ..... | 4 mo. | ..... | 13 mo. | Excellent |
| E.C. | F | 30 | Housewife | Fall | 7-15-47 | D-12 | 4 hr. | 30 da. | 7 mo. | 0 | 13 mo. | Excellent |
| B.W. | M | 44 | Laborer | Fall | 7-24-47 | L-3 | 1 da. | 2 mo. | 3 mo. | 0 | Spinal Fusion | Too early |
| D.C. | F | 35 | Housewife | Auto | 8- 7-47 | D-7 | 2 wk. | 1 wk. | 5 mo. | 2 mo. | 12 mo. | Lost track |
| S.A. | F | 64 | Housewife | Auto | 8-11-47 | D-11-12 | 2 hr. | 6 wk. | 4 mo. | 1 mo. | 12 mo. | Excellent |
| W.C. | M | 37 | Linesman | Fall | 8-17-47 | L-1 | 1 da. | 10 da. | 5 mo. | 1 mo. | 12 mo. | Excellent |
| J.P. | M | 61 | Laborer | Fall | 9- 1-47 | D-9 | 1 wk. | 5 da. | 4 mo. | 2 mo. | 12 mo. | Good |
| K.M. | F | 63 | Housewife | Auto | 9-29-47 | D-12 | 3 mo. | ..... | 4 mo. | 3 mo. | 12 mo. | Poor |
| R.H. | F | 15 | School | Fall | 10-12-47 | L-1-2 | 1 mo. | ..... | 5 mo. | 0 | 10 mo. | Excellent |
| K.P. | F | 24 | Office | Auto | 10-24-47 | D-9-L-1 | 5 da. | 2 wk. | 5 mo. | 2 mo. | 10 mo. | Excellent |
| P.H. | F | 19 | Housewife | Auto | 10-24-47 | D-11-12 | 2 wk. | 4 da. | 5 mo. | 1 mo. | 10 mo. | Excellent |
| C.B. | M | 59 | Laborer | Fall | 11- 1-47 | D-12 | 6 wk. | 1 wk. | 6 mo. | 3 mo. | 9 mo. | Too early |
| C.P. | M | 60 | Carpenter | Fall | 11-13-47 | L-1 | 2 hr. | 8 da. | 5 mo. | 3 mo. | 9 mo. | Too early |
| R.W. | M | 42 | Carpenter | Fall | 11-28-47 | D-11-L-1 | 1 da. | 3 mo. | 6 mo. | 1 mo. | 10 mo. | Excellent |
| F.R. | F | 65 | Housewife | Fall | 12- 3-47 | D-8 | 1 wk. | 8 da. | 4 mo. | 4 mo. | 9 mo. | Too early |
| E.E. | F | 84 | Housewife | Fall | 12- 9-47 | L-1 | 1 da. | 3 da. | 6 mo. | 3 mo. | 9 mo. | Too early |
| M.F. | F | 65 | Housewife | Fall | 12-10-47 | D-12-L-2-3-4 | 2½ mo. | 1 mo. | 6 mo. | 1 mo. | 9 mo. | Good |
| I.B. | M | 52 | Business | Spontaneous collapse | 12-23-47 | D-12 | 3 wk. | 10 da. | 4 mo. | ..... | 4 mo. | Lost track of (carcinoma metastasized to heart) |
| S.R. | F | 85 | Housewife | Fall | 1- 6-48 | L-2 | 1 da. | 5 da. | 2 da. | ..... | Died | Heart |
| A.J. | F | 65 | Housewife | Fall | 1- 6-48 | D-12 | 1 wk. | 6 da. | 6 mo. | 1 mo. | 8 mo. | Too early |
| E.I. | F | 81 | Housewife | Fall | 1- 9-48 | D-6 | 4 hr. | 6 da. | 4 mo. | 4 mo. | 8 mo. | Too early |
| E.S. | F | 75 | Housewife | Fall | 1-11-48 | D-12 | 3 da. | 5 da. | 5 mo. | 2 mo. | 8 mo. | Too early |
| M.B. | F | 81 | Housewife | Fall | 1-11-48 | D-11-12 | 1 wk. | 4 da. | 8 mo. | ..... | 8 mo. | Too early |
| E.A. | F | 35 | Office Work | Auto | 3-15-48 | D-9 | 16 hr. | 1 wk. | 5 mo. | 2 mo. | 7 mo. | Too early |
| N.M. | M | 49 | Carpenter | Fall | 3- 1-48 | L-1 | 6 wk. | 1½ wk. | ..... | ..... | Died | Heart |
| R.A. | F | 44 | Housewife | Auto | 3-24-48 | D-7 | 2 hr. | 5 da. | 5 mo. | 5 mo. | 5 mo. | Too early |
| J.T. | M | 39 | Mechanic | Motorcycle | 3-14-48 | L-1 | 10 da. | 4 mo. | ..... | ..... | 4 mo. | Too early |
| S.D. | F | 7 | Schoolgirl | Fall | 4- 9-48 | D-8 | ½ hr. | 3 da. | 4 mo. | 2 wk. | 4½ mo. | Too early |
| E.B. | F | 52 | Housewife | Spontaneous collapse | 3-19-48 | D-12 | 2 mo. | 2 wk. | 5 mo. | ..... | 5 mo. | Comfortable in brace |
| L. G. | F | 37 | Housewife | Auto | 5-29-48 | L-2 | 1 da. | 6 da. | 3 mo. | ..... | 3 mo. | Too early |
| L. J. | M | 34 | Laborer | Auto | 5-30-48 | D-8 | 1 yr. | 0 | 3 mo. | ..... | 15 mo. | Comfortable in brace—needs fusion |
| B. R. | F | 62 | Housewife | Auto | 6- 5-48 | L-1 | 2 mo. | 0 | 1 mo. | ..... | 3 mo. | Too early |
| C.D. | M | 26 | Laborer | Fall | 6-21-48 | D-12-L-1 | 4 hr. | 2 wk. | 2 mo. | ..... | 2½ mo. | Too early |

developed by which a hyperextension back brace of Dow metal could be made from measurements taken with the patient on the hyperextension bed. By the time complete restoration of the normal alignment of the spine and reduction of the compression fracture have been obtained (from a few days to two weeks) a brace is usually ready to be put on. It has entailed a great deal of trial and error to work out a system of making a well fitting brace from measurements alone, without the use of a plaster model. However, the process has now been brought to a satisfactory standard, although, of course, most of the braces have to be slightly altered when the patients become ambulatory. The same, however, applies to braces modeled from plaster casts.

From the start I have realized that the entire framework of the brace must be of light metal, with no leather or similar straps to attempt maintenance of the body in hyperextension. The sternal plate must be well padded and must at all times rest as high on the sternum as possible without extending above the upper border of the manubrium. The lower anterior pad or plate should lie on the symphysis pubis and must be made so that it does not cut into the groin when the patient sits down. The back support was formerly made of a single piece of metal, but now I use a plastic pad with two metallic bands 1 inch (2.5 cm.) in width running through it. These bands are securely fastened to both side bars of the brace, one side being anchored with screws or bolts and the other having adjustable screw devices. After being fitted correctly, these threaded locking connections are so secured that the patient cannot loosen the bands himself. In rare instances, with complete supervision at home, the patient may be allowed to sleep without his brace on a hyperextension bed similar to the one he had in the hospital. However, the brace must be removed and replaced only while the patient is in bed and in hyperextension.

Crutches, with or without a pelvic band, are added when the fracture is of a type to preclude any lateral movement. Patients with

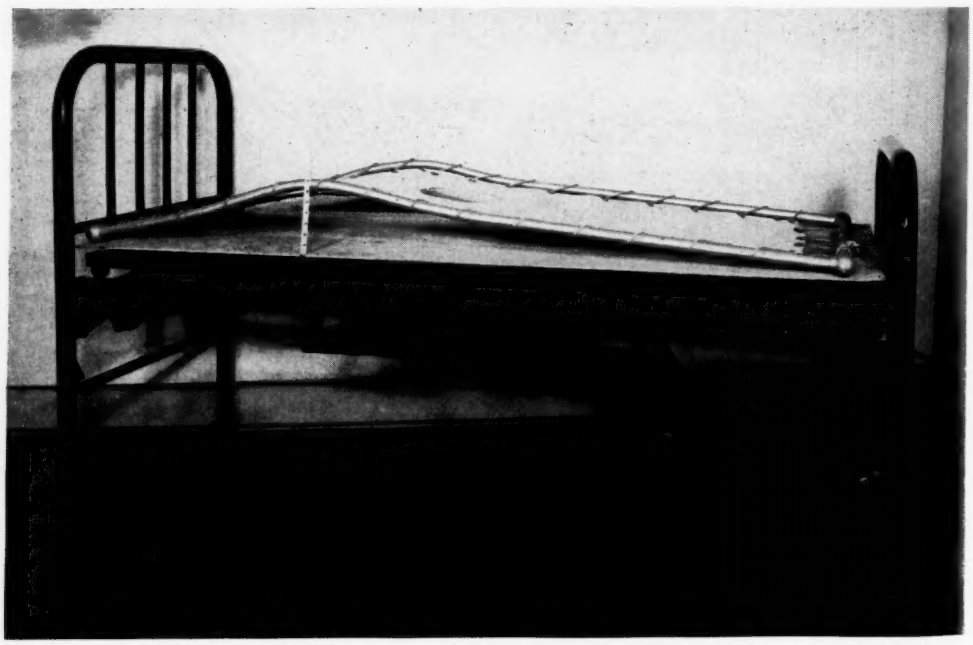

Fig. 2.—Hospital bed with Bradford frame. Maximum elevation of 6 inches (15.2 cm.) from bed level.

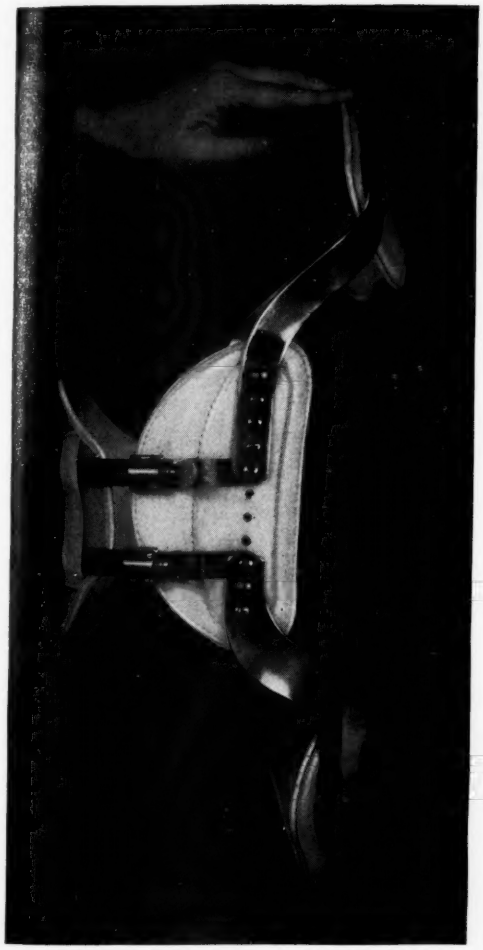

Fig. 3.—Side view of hyperextension brace.

fractures of the upper dorsal portion of the spine must have cervical extension put on this brace with the neck held in hyperextension.

Figures 1 and 2 show the ordinary Gatch hospital bed and the Bradford frame; Figures 3 and 4, the hyperextension brace. The roentgenograms in Figures 5 and 6 indicate the results obtained by use of this brace in 2 cases. The table is a synopsis of data on my 58 patients treated by this method without the use of plaster casts from June 16, 1946, through June 5, 1948. The oldest patient was an 85-year-old woman and the youngest a 7-year-old girl.

This is a consecutive list. Since it was compiled I have had 29 more patients associates, Dr. Newton C. McCollough and Dr. Royston Miller, have had 20 more patients during the past year and a half. This makes a total number of 88 patients treated since January 1946. Forty-eight of these were treated before the war, so that 136 have been treated with the hyperextension back brace since 1936, 88 of whom have had no plaster of paris casts.

This type of brace has been highly successful for other patients suffering from pain in the back due to spinal osteoporosis with or without collapse of a vertebral body, and also for young persons with Scheuremann's adolescent osteoporosis. In fact, for any dorsal condition in which hyperextension or rigid immobilization is desired, this type of brace will be found adequate.

## ANALYSIS OF CASES

There were 22 male patients aged from 17 to 77 (average age, 40.6 years) and 36 female patients aged from 7 to 85 (average age, 51.4 years). The number of average days in bed in

Fig. 4.—Side view of hyperextension brace as worn by patient.

Fig. 5.—Fracture of first lumbar vertebra. *Left*, at time of injury; *right*, six months later.

48 uncomplicated cases was 7.3. The average full time spent in the brace was three and seven-tenths months; the average part time, one and seven-tenths months. There were 2 deaths within two months after injury. There were 8 cases in which fractured spines were complicated with other conditions, necessitating a longer time in bed.


SUMMARY

A method is presented for treating compression fractures of the lower dorsal and lumbar portions of the spine without the use of plaster casts or hyperextension other than on a reversed Gatch bed. Neither general nor local anesthesia is employed, and the patient is usually ambulatory within a week or two after trauma. On the whole, the results have been excellent.

RÉSUMÉ

On présente une méthode de traitment des fractures par compression dé la dernière portion des vertèbras dorsales et des vetèbres lombaires de la colonne vetébrale sans employer d'appareil plâtré ou d'hyperextension autrement que par un lit soulevé de Gatch. On n'employa ni anesthésie locale, ni générale, et le malade marche habituellement au bout d'une semaine ou deux après l'accident. En bref, les résultats ont été excellents.

RESUMEN

Se presenta un método para tratar las fracturas por compresión de las partes dorsal inferior y lumbar de la columna vertebral sin emplear enyesados ni hiperextension, excepto la usada en un lecho invertido de Gatch. No se emplea anestesia general ni local y el paciente queda ambulatorio en general dentro del plazo de una semana o dos después del traumatismo. En conjunto los resultados han sido excelentes.

RIASSUNTO

Espone un metodo di cura per le fratture da compressione della porzione più bassa della colonna dorsale e della colonna sacrale, che non richiede nè ingessatura, nè iperestensione, nè anestesia locale o generale, ma solo una modificazione del letto di Gatch.

Gli ammalati possono già carrina re 1-2 settimane dopo il trauma; i risultati sono stati—nel complesso—ottimi.

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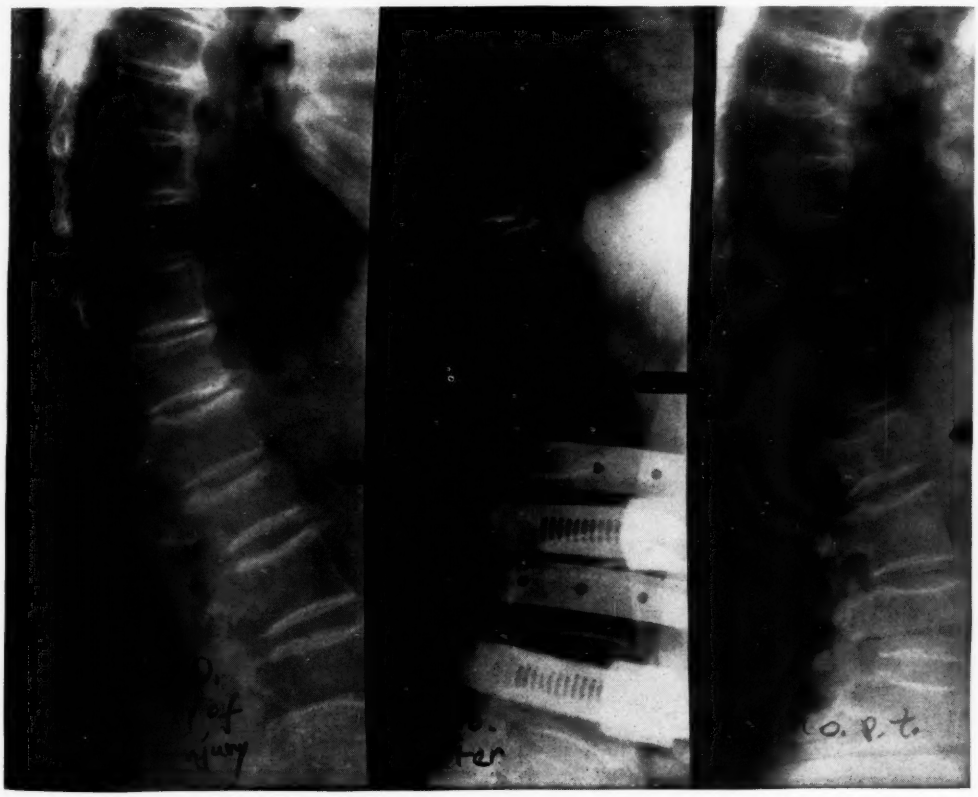

Fig. 6.—*Left*, roentgenogram taken on day of injury. *Center*, appearance one month later. *Right*, film taken three months after injury.

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## Some Opinions on Science

Science is simply common sense at its best—that is, rigidly accurate in observation and merciless to fallacy in logic.—*Huxley.*

Science is a first-rate piece of furniture for a man's upper chamber, if he has common sense on the ground floor.—*Holmes.*

Science keeps down the weed of superstition not by logic, but by rendering the mental soil unfit for its cultivation.—*Tyndall.*

Every great advance in science has issued from a new audacity of imagination.
—*Dewey.*

# Corneal Incision for Cataract

## Authors' Technic

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AMONG American ophthalmologists it is generally conceded that deep corneal or corneoscleral sutures offer certain definite advantages over more superficial sutures in the closure of cataract incisions. Most surgeons agree that such deeply placed sutures (*a*) reduce the incidence of wound separation, iris and/or vitreous prolapse (*b*) decrease the amount of corneal astigmatism; (*c*) permit earlier ambulation, and (*d*) aid in the prevention of epithelial downgrowth. There is much evidence that hyphema is also reduced, but there is some controversy over this point. The disadvantages of deep sutures are that (*1*) the operation is rendered more complicated; (*2*) removal of these sutures is attended with some hazard, and (*3*) irritation and discomfort are caused by a suture if any portion of it encroaches upon the cornea.

Although our own experience confirmed the advantages of deep corneoscleral sutures, we felt that the incidence of hyphema was too high. In an effort to reduce the incidence of postoperative bleeding, the logical procedure is to consider the source of such bleeding. Vail[1] and others have shown rather conclusively that such bleeding arises from newly formed vessels bridging the wound. It would seem, then, that one may expect to encounter such vessels most frequently in the sclera or the limbus and less frequently in clear cornea.

In making a corneal incision, three approaches are possible. One may dissect down a conjunctival flap, split the cornea and make the incision in the cornea. Such an incision interrupts nearly as many vessels as does an incision directly at the limbus or the corneoscleral junction. An alternative would be to omit the conjunctival flap, begin the incision in the sclera or the limbus and enter the anterior chamber via the cornea. Here, again, many vessels are interrupted. The only way to avoid these vessels completely is to omit the conjunctival flap and make the incision directly in clear cornea.

The disadvantages of a pure corneal incision would seem to be as follows: (*a*) corneal astigmatism might be greater because of the flaccidity and reduced resilience of the cornea[2]; (*b*) keratitis would seem to increase because the avascular cornea has poorer opportunity for repair; (*c*) infections could be increased where the wound was not covered by conjunctiva; (*d*) prolapse of the iris would be invited and, when it did occur, would be more dangerous and more difficult to repair; (*e*) epithelial downgrowth would probably be more frequent.

In the past decade many types of preplaced corneal and corneoscleral sutures, with and without conjunctival flaps, have been described. These have recently been reviewed by Bell.[3] Most so-called corneal incisions are actually limbal incisions. To our knowledge, no one in recent years has presented a series of cases with preplaced sutures in clear cornea. The technic herein described has been utilized in 300 consecutive cases. Statistical data with comparative figures for other procedures are submitted, showing the relative attributes of each.

### TECHNIC

Preoperatively, homatropine (5 per cent) and paredrine (1 per cent) are instilled. Pontocaine (1 per cent) is used for topical anesthesia. A modified Van Lint infiltration is preferred for akinesia. The lashes of the upper lid are trimmed, and warmed bichloride of mercury ointment (1:3,000) is injected into the inferior lacrimal canaliculus. Horner's lid sutures[4] are inserted in the upper and lower lids, and a bridle suture is placed under the superior rectus muscle. Retrobulbar injection of novocaine (with epinephrine, 3 minims to the ounce) is routine.

Fixation is accomplished with an Elschnig

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forceps at 6 o'clock. A Bard-Parker knife (blade No. 15) is used to make a partial incision in the cornea concentric with the limbus from 9:30 to 2:30 o'clock (Fig. 1*A*). The ideal location is at the terminal loops of the limbal vessels. The incision penetrates to about one-third the thickness of the cornea. It is important to keep the heel of the blade elevated so that redundant conjunctiva does not get beneath it.

Five corneal sutures are placed, one each at 10, 11, 12, 1 and 2 o'clock (Fig. 1*B*). Atraumatic 000000 black silk sutures (Davis and Geek C-301) are inserted in the lips of the wound, the needles passing from the sclera toward the center of the cornea. These tracts should be tangential with the cornea. The sutures need be only deep enough and wide enough to make firm closure. A bite on either side of the wound 0.5 mm. wide and 0.2 mm. deep is ideal. The suture should not be placed deeper than the depth of the incision.

With a sharpened punctum dilator the sutures are picked up in the prepared slotted wound and looped aside (Fig. 2*A*). The speculum is now removed. A keratome incision is made at 12 o'clock and continues into the anterior chamber until the incision extends up to the sutures at 11 and 1 o'clock (Fig. 2*B*). The assistant grasps the looped suture on each side, causing the preplaced slotted wound to gape slightly as the incision is made. After the keratome enters the anterior chamber, the assistant releases the hold on the sutures.

The incision is enlarged to 3 and 9 o'clock with Westcott scissors (Fig. 3*A*). The surgeon grasps the loop of the suture closest to him, and the assistant holds the anterior suture. These sutures should be grasped as close to the wound as possible. Only enough traction should be used to make the wound gape slightly.

An iridotomy is made at approximately 12 o'clock (Fig. 3*B*). This is done with the Barraquer butterfly iris scissors. If the pupil is widely dilated and most of the iris is under the corneal lip, a forceps is used to drag the iris toward the center of the pupil. The iris is never actually grasped with a forceps unless an iridectomy is to be done.

The Arruga forceps is preferred except when the lens is intumescent, in which case the Barraquer erisphake is used. With the former, the lens capsule is grasped at the 6 o'clock position, the forceps passing beneath the iris (Fig. 4*A*). Traction is placed on the capsule, and counter massage is affected with a muscle hook, the foot and sole of the hook, not the toe or the heel, being utilized. The counter massage is placed just inside the corneo-

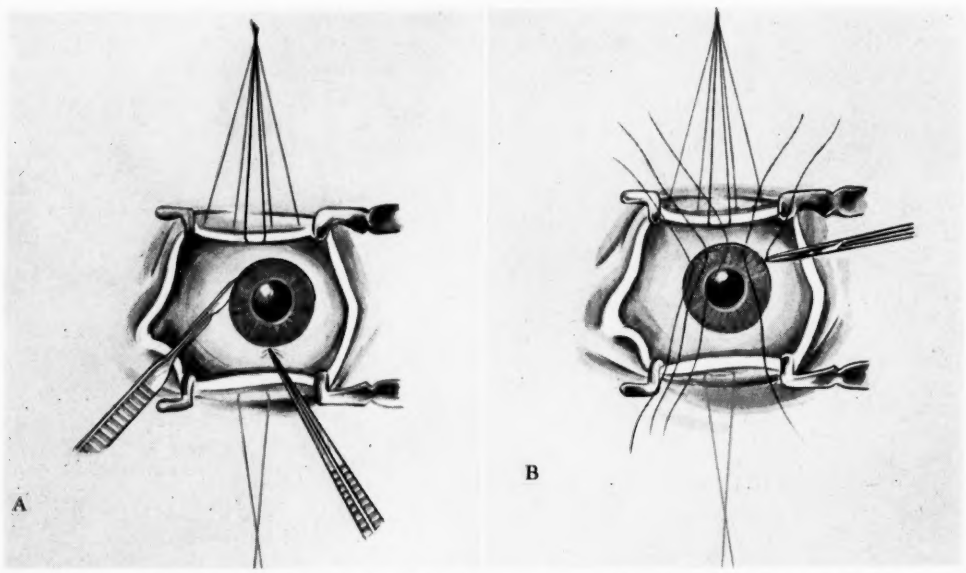


Fig. 1.—*A*, partial incision with Bard-Parker knife in cornea, concentric with limbus (see text). *B*, five corneal sutures placed at 10, 11, 12, 1 and 2 o'clock respectively.

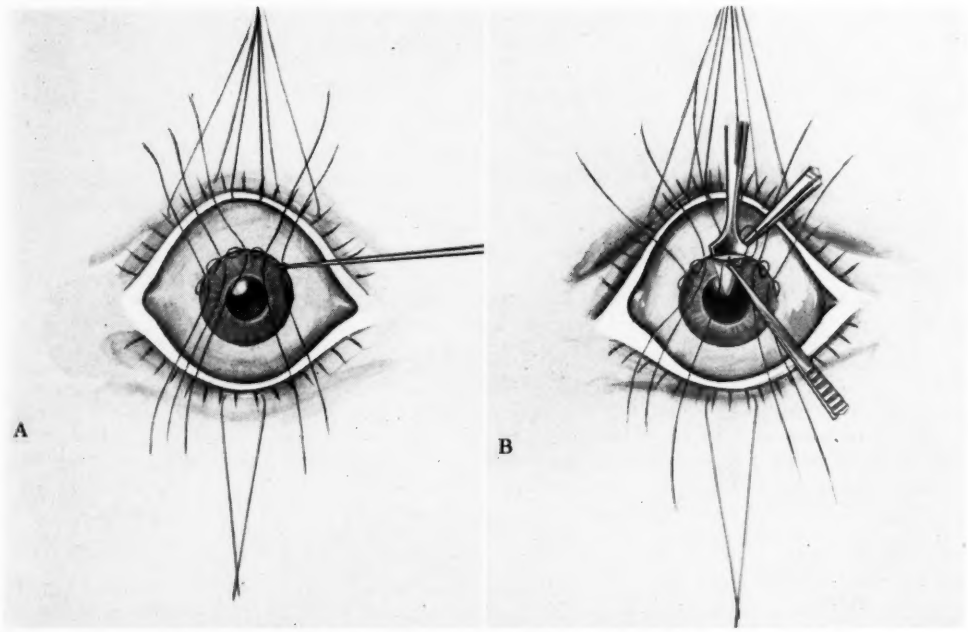


Fig. 2.—*A*, sutures picked up and looped aside (see text). *B*, keratome incision made at 12 o'clock continues into anterior chamber until incision extends up to sutures at 11 and 1 o'clock.

scleral junction. Pressure against the vitreous is avoided, and the procedure is one of stripping the zonule through the cornea. Only enough tension is placed on the capsule to make it taut.

No wheel-like torsion or rocking of the forceps is used. When the zonule ruptures, the massage is continued around the limbus until the equator enters the anterior chamber, when it is tumbled.

The sutures are tied with simple square knots, the suture at 12 o'clock being tied first and the sutures at 10 and 2 o'clock last (Fig. 4*B*). Air is injected into the anterior chamber. One per cent pilocarpine and sulfathiazole ointment are instilled in the conjunctival sac. The suture in the lower lid is removed. The suture in the upper lid is pulled through at each end and used to close the lids by means of Scotch tape over the cheek. Only the eye operated upon is patched and shielded, the other eye remaining uncovered.

During the first twenty-four hours the patient is permitted to sit on the edge of the bed. At the end of this time the dressing is changed and the eye inspected. Atropine (1 per cent) is instilled. At this time the patient is permitted out of bed and may walk around the room. Daily dressings follow. Sutures are removed on the tenth to the thirteenth day, depending upon the cooperation of the patient.

## COMMENT ON TECHNIC

Pontocaine is preferred to cocaine; anesthesia is adequate, and there is less drying of the cornea. There is also less likelihood of local or general toxic reaction. Bichloride of mercury is injected into the canaliculus to thwart the growth of any organisms lying dormant in the lacrimal sac.

A modified Van Lint[5] injection is preferred to the O'Brien[6] akinesia. For reasons not totally clear to us, use of the latter is occasionally followed by some anxiety or giddiness. The injection is made directly over the rim of the orbit, extending to the inner limits of the brow above and the base of the bridge of the nose below. The injection should be to the level of the periosteum. Such injections give good akinesia and do not cause any troublesome swelling of the lids. We make a small bleb in

the upper and lower lid near the free margin of the lid because of the placement of lid sutures.

For retrobulbar injection we prefer 2 per cent novocaine with 3 minims of epinephrine (1:1,000) to the ounce. More epinephrine than this causes too great hypotony. About 1.5 cc. is injected.

Homatropine is adequate to dilate the pupil in most cases. A widely dilated pupil is desirable in grasping the lens, but it is not absolutely necessary when the lens is to be grasped at the 6 o'clock position. Koke[7] has hypothesized that, since sympathetic stimulants widen the zone between the lens equator and the ciliary processes and produce added recession of the anterior vitreous, this principle could be used to advantage in the surgical treatment of cataract. He instilled 2 per cent scopolamine and 10 per cent neosynephrine. Homatropine and paredrine are a much weaker combination but pay tribute to this contention. We prefer the weaker cycloplegics and mydriatics in order that miotics may be used to better advantage at the conclusion of the operation.

In our opinion there is no question about the advantages of preplaced sutures. In the first place, much of the operation is completed before the anterior chamber is opened. The shorter the time the intraocular tissues are exposed to the outside world, the less the danger of infection or unfavorable tissue reaction. Second, there can be no doubt that approximation of the lips of the wound can be more exact when the sutures are placed before the incision is completed. Finally, there is less trauma in placing the sutures before the incision is made, because there is less distortion of the lips of the wound and the lips need not be grasped with a forceps.

There may be some argument that five sutures make a difficult field in which to work. Without able assistance this would certainly be true. However, with four hands, the sutures can be manipulated easily, so that they are no more troublesome than one or two sutures. Needless to say, it would be very difficult to cut between five sutures if the Graefe cataract knife were used. With the keratome and scissors, however, the sutures are not troublesome

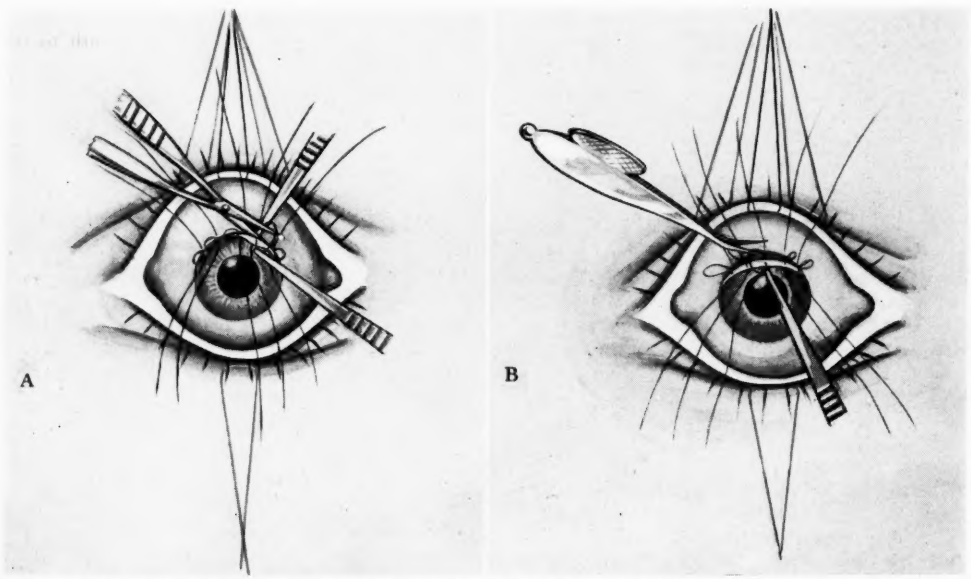


Fig. 3.—*A*, incision enlarged to 3 and 9 o'clock with Westcott scissors. *B*, iridotomy made at approximately 12 o'clock.

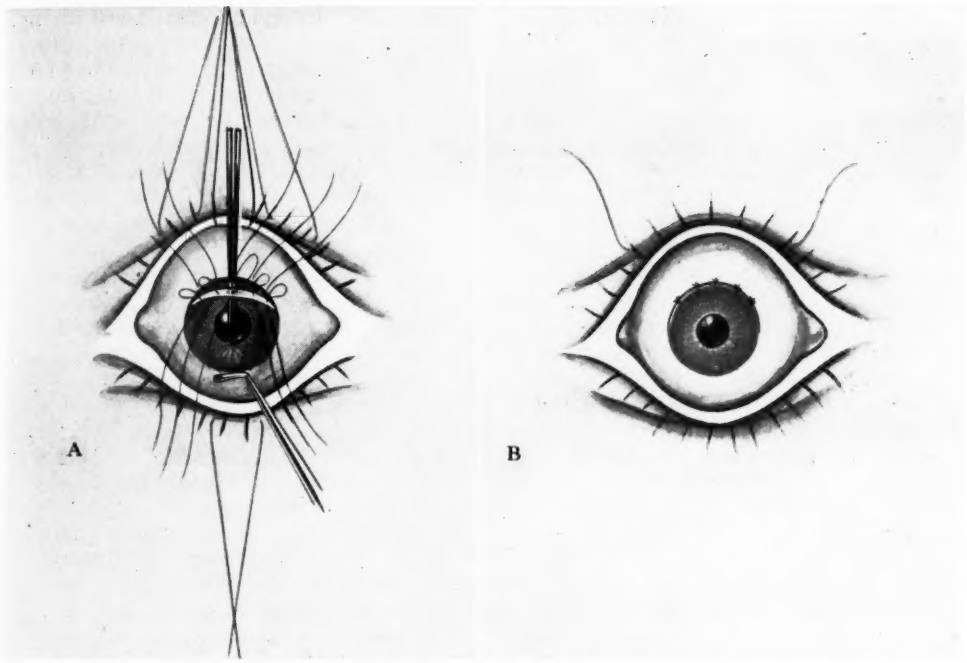


Fig. 4.—*A*, lens capsule grasped at 6 o'clock position, with forceps passing beneath iris (see text). *B*, sutures tied with square knots, the suture at 12 o'clock being tied first and those at 10 and 2 o'clock last.

and actually aid in guiding the direction of the incision. This number of sutures is justified because of the reduced incidence of prolapse of the iris and because the cornea is more readily fitted into its original position.

Some type of gutter must be made before the suture is placed. In pointing out the merits of an ideal suture, McLean[8] stated that such a suture should not go over the lips of the wound, because of the danger of inversion of the edges. A modified Lunsgaard knife is adequate for such a slot, but we find a Bard-Parker blade No. 15 easier to handle. Because the incision is made in one sweep, a new blade is used each time in order to have consistently sharp blades. The incision is made either in clear cornea or at the point where the terminal loops of the limbal vessels are encountered. In the latter case there is just enough bleeding to make the wound visible. In this location it is much easier to place the sutures exactly as desired, as there is corneal tissue on either side of the wound. When one lip is covered with conjunctiva, the latter not only slides back and forth over the wound but partially obscures the underlying tissue.

Too deep a wound is prone to cause splitting of the corneal lamellae when the sutures are placed. Repeated incisions unnecessarily traumatize the cornea and tend to make the slot wider and more irregular. In this series of cases the incision was made perpendicular to the surface of the cornea. Recently the incision has been made obliquely, and in our opinion this promotes firmer union.

The speculum is removed before the keratome incision is made. We see no reason to disable a perfectly good assistant by having him elevate the speculum when sutures hold the lids apart adequately. The speculum is used prior to the incision, as it helps to hold the globe more rigidly and this facilitates placement of the sutures.

Unless the globe is deeply set in the orbit, a large keratome is preferred. The incision is made as close to the posterior lip of the wound

as possible. If this is done, the incision more closely follows the line of the original slotted incision.

The Westcott scissors is an ideal instrument for completing the corneal incision. Either hand may be used, whether the surgeon is ambidextrous or not. The outer blade should lie nearly flat against the sclera; otherwise, the incision is too nearly perpendicular to the surface of the cornea, and this invites prolapse of the iris. The broader the two opposing surfaces, the better is the healing.

A good iridotomy is of equal value to a peripheral or a complete iridectomy. We agree with Hilding[9] that the reason for the iridectomy or iridotomy is to furnish communication between the posterior and the anterior chamber. Such communication not only prevents prolapse of the iris but discourages a shallow chamber. After the chamber is re-formed but before normal intraocular pressure occurs, there may be a tendency for the hyaloid to plaster itself so intimately to the posterior surface of the iris that the aqueous cannot pass through the pupil. If there is no other communication between the anterior and posterior chambers, the iris diaphragm is pushed forward, creating a shallow chamber or even prolapse. In the former case, it matters little where the iridotomy is. In preventing prolapse of the iris as Hilding[10] has so beautifully illustrated, the place for the iridotomy is adjacent to the incision. Hilding further demonstrated that an iridotomy is needed least where the suture lies. With our closure, however, prolapse of the iris has been such a minor problem that we place the iridotomy at or near 12 o'clock. One iridotomy is as good as several, so long as it functions. If it becomes filled with exudate or pigment or is rendered ineffective by adherent vitreous, it does not function. In this series only 1 iridotomy was performed. At present we are performing 2 iridotomies, 1 each at 11:30 and 12:30 o'clock.

For delivery of the lens, the Arruga forceps is preferred unless the lens is intumescent and/or hypermature, when the Barraquer technic is used. In using the Arruga forceps, there are many methods available. Kirby[11] grasps the upper portion of the capsule because it is easier to visualize and there is no backward pressure against the lens. Our preference is for the tumbling method of Knapp,[12] with some modification. The capsule is grasped at the 6 o'clock position, the forceps passing below the iris. The capsule is lifted toward the center of the cornea to put traction on the zonule. Simultaneously a stripping motion is made with the flat foot of a muscle hook just inside the corneoscleral junction. This strips the zonule in much the same manner as one would dissect a tonsil from the upper pole of its fossa. Initially, no other motion of the forceps is used, as we consider it unnecessary and likely to rupture the capsule. After the lower equator is subluxated, the stripping of the zonule is continued on either side until the lens appears in the wound. Then a wheel-like rotation of the lens is permitted until the upper portion of the zonule is stripped. We see no advantage in releasing the hold on the capsule when the lens is dislocated unless the capsule tears. Should this occur, the capsule is grasped elsewhere at the equator with the Verhoeff forceps and the lens delivered as one would empty an open sack of water.

The importance of exerting the so-called counterpressure against the zonule rather than against the vitreous cannot be overemphasized. Loss of vitreous should occur only when there are adhesions between the capsule and hyaloid or when the hyaloid membrane has degenerated. Even a fluid vitreous need not be lost if the hyaloid membrane is intact. A very good example of the difference in the two procedures is illustrated in the case of 1 patient who had 2 similar cataracts. At the limbus of the eye in the 6 o'clock position was a large growth, presumably an arrested congenital dermoid. In this eye, so-called stripping of the zonule was impossible; the force had to be exerted against the sclera and consequently against the vitreous. Semifluid vitreous was lost. In the other eye no vitreous was lost, and postoperatively the vitreous was found to be semifluid also.

In the method of tumbling described here, it makes little difference how well the pupil is dilated. The important question is not how well the pupil is dilated, but how well it will dilate. A normal-sized lens can be delivered through a relatively small pupil without too much trauma to the sphincter. An atrophic iris will not so readily accept such stretching. We

are more concerned here with the possibility of iritis. An atrophic iris is not only more prone to postoperative inflammation, but such inflammation is more difficult to handle, because the iris is rather refractory to cycloplegics.

When the capsule breaks before the lens is delivered from the wound, it is desirable to pick up the remaining capsule if at all possible. A great aid in this maneuver is the Hildreth lamp. This will "fluoresce" both capsule and cortex and facilitate their removal.

The injection of air into the anterior chamber is highly desirable. It has a twofold purpose. First of all, it splints the iris and irons it out flat, discouraging any early prolapse or even contact with the wound. Furthermore, it helps to restore not only the anterior chamber but the intraocular volume and pressure. An air bubble can actually be harmful, however. If the pupillary portion of the iris is depressed, the ciliary region may actually be heaved forward toward the wound. When an iridectomy has been done, the pillars may be similarly pushed against the cornea. In any case one should not permit air to enter the posterior chamber. There may be some argument that air acts as a foreign body, but clinically this does not appear to be the fact.

Pilocarpine is valuable postoperatively as a miotic. Some surgeons use eserine. This is satisfactory, but it should be combined with pilocarpine when a retrobulbar injection has preceded the operation. After this injection no acetylcholine is liberated, which renders an anticholinesterase somewhat useless until the effect of the novocaine has worn off. Pilocarpine is adequate in most cases and rarely causes discomfort. Eserine occasionally causes discomfort and is inclined to induce a more plasmoid aqueous.

The objection to any ointment in the eye after the operation is justified when no sutures are used. In the procedure described here, entry of ointment into the anterior chamber is almost impossible and has not been observed. Preference is given to the antiseptic properties of the ointments. Any sulfonamide or antibiotic is satisfactory.

For a dressing, the lid is closed and held in place with the lid sutures taped to the cheek. Before the patch is applied, a perforated Cilkloid* dressing is placed over the lids. This prevents the pad from adhering to the lashes or the lids. An aluminum shield is preferred to a large mask of the Ring type. The latter is difficult to apply and even more difficult to remove because of the extensive manipulation of the head. There seems little reason to patch the opposite eye.

## RESULTS

This report is based on the results in 300 consecutive cataract operations. Except for the visual results and the amount of postoperative astigmatism, all 300 cases are included in the statistics. Patients with other pathologic conditions, such as retinitis pigmentosa, senile macular degeneration, glaucoma, chorioretinitis, etc., are not included in the data on visual results or astigmatism.

*Intracapsular Extraction.* — So convinced are we of the advantages of intracapsular over extracapsular extraction, that an extracapsular extraction is rarely attempted. It is performed only when it is apparent that the zonule is too resistant or the capsule is adherent to surrounding structures, especially the hyaloidea vitrea.

Our criterion for an intracapsular extraction is that the lens capsule must be intact when it leaves the wound; examination of the lens reveals no rent in the capsule, and subsequent examination of the eye shows no evidence of cortical or capsular remains. An extraction in which the capsule is broken prior to or during delivery through the wound, even though all cortex and capsule are removed afterward, is indicated as plus-minus. Any flakes of cortex or capsule, however small, evident at the conclusion of the operation or during the convalescence are indicated as extracapsular extractions.

By these standards, 84 per cent of our operations were intracapsular extractions. An additional 9 per cent were plus-minus extractions, and 7 per cent were extracapsular extractions. Of the 21 extracapsular extractions, needlings were subsequently necessary or advisable in 4 cases. Of the 41 hypermature cataracts, 74 per cent were removed in the capsule. An additional 12 per cent were plus-minus. It is interesting that only one of the hypermature cataracts with extracapsular extraction required a subsequent needling.

TABLE 1.—*Patients Under 45 on Whom Intracapsular Extraction Was Attempted*

| Patient | Sex | Age | Type of cataract | Type of extraction | Final vision |
|---|---|---|---|---|---|
| 1 | M | 30 | Cataracta lacta | Intracapsular | 20/15 |
| 2 | M | 43 | Retinitis pigmentosa | Intracapsular | 20/100 |
| 3 | F | 23 | Posterior traumatic; hypermature | Intracapsular | 20/20 |
| 4 | F | 42 | Congenital | Intracapsular | 20/20 |
| 5 | F | 42 | Congenital | Intracapsular | 20/20 |
| 6 | M | 43 | Posterior subcapsular | Intracapsular | 20/15 |
| 7 | M | 43 | Posterior subcapsular | Intracapsular | 20/20 |
| 8 | M | 33 | Posterior subcapsular | Intracapsular | 20/15 |
| 9 | M | 33 | Posterior subcapsular | Intracapsular | 20/20 |
| 10 | M | 26 | Congenital | Intracapsular | 20/20 |
| 11 | M | 26 | Congenital | Intracapsular | 20/25 |
| 12 | F | 42 | Morgagnian; diabetes | Intracapsular | 20/20 |
| 13 | F | 42 | Posterior subcapsular; diabetes | Extracapsular (+ −) | 20/20 |
| 14 | F | 37 | Posterior subcapsular; diabetes | Intracapsular | 20/15 |
| 15 | F | 37 | Posterior subcapsular; diabetes | Intracapsular | 20/15 |
| 16 | M | 44 | Posterior subcapsular; diabetes | Intracapsular | 20/15 |
| 17 | M | 30 | Complicated | Extracapsular | 20/20 |
| 18 | F | 38 | Complicated | Intracapsular | 20/20 |
| 19 | M | 33 | Retinitis pigmentosa | Extracapsular (+ −) | 20/25 |

Vitreous loss or vitreous presentation including those cases of fluid vitreous was encountered in 11 cases (3.6 per cent).

In the entire series, the sphincter was left intact in 96 per cent of the cases.

### AGE

It is a common dictum among ophthalmic surgeons that the older the patient, the easier the subluxation of the lens. Furthermore, Knapp[13] has stated that persons under 45 years of age are not usually suited for intracapsular extractions. The results in patients under 45 years of age have been very interesting. In this series are 19 eyes (13 patients) on which intracapsular extractions were attempted (Table 1). Of these, 16 were removed in the capsule and 2 were classified as plus-minus. Case 17 in Table 1 subsequently required a needling. Round pupils were retained in the entire series.

Two observations are worthy of note. In only 3 of the cases was the zonule found to be abnormally resistant, and in only 1 case (Case 11) was there any abnormal postoperative reaction. As a matter of fact, there was a conspicuous absence of reaction in all of these patients. The patient in Case 9 is worthy of special consideration. He was one of the patients in whom prolapse of the iris occurred; it was evident on the first dressing. The iris was reposited without difficulty, and he has a perfectly round pupil with good vision. The operation was performed with sodium pentothal anesthesia because of marked anxiety. Postoperatively the patient suffered from retention of urine, which we believe to have been a possible factor in his prolapse.

The youngest patient in this series was 26 years old. He is the youngest patient upon whom we have attempted an intracapsular extraction. His convalescence was uneventful.

### HYPHEMA

Prior to the use of corneal sutures we encountered hyphema in some 6 to 8 per cent of cases. In several of these the condition was rather severe and resulted in definite visual impairment. In this series of 300 cases hyphema was encountered in only 6 cases, and it was never severe. In the case in which it was most extensive it followed an accidental self inflicted blow with the patient's fist. Between dressings the patient was pulling up his bed clothing when his hand slipped and struck his unshielded eye. Prolapse of the iris resulted

and the blood did not even cover the entire pupillary aperture. All traces were absorbed in two days, and his final vision was 20/15.

In the other 5 cases the bleeding was very slight and practically insignificant. In 3 of them it followed self inflicted trauma. In 1 case in which no trauma could be traced hyphema occurred at night in a patient with chronic uveitis. In the sixth case there was a slight streak of blood in the aqueous the day after removal of the sutures. In none of these 5 cases was the blood grossly visible at the end of twenty-four hours.

We feel that the infrequency of hyphema is one of the greatest advantages of a corneal incision. There is no more depressing episode than to see an otherwise perfect result marred by blood mixed with vitreous. With a corneal incision the fear of any bleeding is practically nil.

The lowest incidence of hyphema was reported by Stallard,[14] who encountered no hyphema in 107 cases. However, Leech and Sugar[15] used the same technic and noted an incidence of 4.6 per cent. Hughes and Owens,[16] in reviewing 2,086 extractions of senile cataract, recorded an incidence of 9.3 per cent. When corneoscleral sutures were used, the incidence was 4.6 per cent.[17] Lee,[18] using a modified Liegard corneo-episcleral suture, reported hyphema in 6.6 per cent of his cases. Kirby's series[19] showed hyphema in 8 per cent of his operations for cataract. McLean[20] reported an incidence of 3.6 per cent.

We have no doubt that the general condition of the patient has little to do with the incidence of hyphema, at least when a corneal incision is used. Not one of our 6 patients with hyphema had either diabetes or arterial hypertension. Furthermore, in this series there were 33 patients with diabetes, in some instances severe, and hyphema was not encountered in any of them. Philps[21] expressed the opinion that there is a tendency to hemorrhage from the iris in cases of diabetes. This is probably true of rubeosis iridica diabetica, but it has not been our experience when rubeosis was absent.

### INCOMPLETE WOUND CLOSURE

A shallow or obliterated anterior chamber is an indication that wound closure is not secure.

TABLE 2.—*Comparative Data on Several Series of Cataract Extractions with Deep Sutures*

| Author | Number of cases | Intracapsular extractions, % | Delayed or incomplete wound closure, % | Hyphema, % | Iris or vitreous prolapse, % | Iritis, % | Retinal detachment, % | Secondary glaucoma, % | Average amount of astigmatism | Selected (extraneous causes of poor vision excluded†), 96.7% |
|---|---|---|---|---|---|---|---|---|---|---|
| De Roeth | 35 (unselected) | 63 + 8* | 8.6 | 5.7 | 2.8 | 0 | 0 | 0 | 1.6 D | ..... |
| Stallard..... | 107 | 25 | ..... | None | ..... | 0 | ..... | ..... | 1.5-2.5 D | ..... |
| McLean..... (series 2) | 110 (unselected) | 88 | 3.6 | 3.6 | 2.7 | 0 | ..... | ..... | 1.32 D | ..... |
| Leech-Sugar... (series 2) | 150 | 51 | 2.6 | 4.6 | 4 | 0 | ..... | ..... | 1.82 D | ..... |
| Kirby..... | 100 (unselected) | 90 + 1* | ..... | 8 | 1 (?) | 6 | 1 | 3 | 1.5 D | Unselected, vision 20/30 or better, 86%; 20/200 or less, 4% |
| Hughes-Owens (series 2) | 380 (selected) | ..... | 0.3 | 4.5 | 1.2 | 1.4 | 0.5 | 1.6 | 1.4 D | 20/30 or better, 91.7%; less than 20/200, 1.9% |
| Wolfe..... | 300 (unselected) | 84 + 9* (96% round pupils) | 12 | 2 | 1.6 | 4 | None | 0.6 | 0.92 D | 20/30 or better, 97%; less than 20/200. 0 |

*Cases in which the capsule and cortex were removed in toto after expulsion of the lens.
†Excluded are such cases as those in which there was inadequate refraction or in which extraneous causes existed for poor vision (uveitis, senile macular degeneration, retinitis pigmentosa, diabetic retinopathy, etc.).

At some time during the postoperative course there were 15 cases in which the chamber was flat and an additional 21 in which the chamber was abnormally shallow. The average number of days in which the chamber was abnormal was three. The phenomenon existed five days or longer in 8 cases.

Secondary glaucoma occurred in 2 cases. In 1 of these, an air bubble was not injected into the anterior chamber at the conclusion of the operation and the chamber remained flat or nearly so for thirteen days. In the other case the chamber was never flat but remained shallow for fourteen days. Consequently, a shallow chamber may have the same qualitative significance as an obliterated chamber.

Most commonly the phenomenon of abnormal chamber occurred on the tenth to the twelfth day. In some cases it followed removal of sutures, but in nearly an equal number it preceeded removal of the sutures. In some patients a leaky wound could be demonstrated, but in most of them no cause for the abnormal chamber could be demonstrated.

Comparative statistics for these data are difficult to evaluate. For instance, McLean presented figures for delayed union of the wound or delayed reformation of the anterior chamber. Whether he included only first dressings, delayed loss of chamber following removal of sutures, etc. is not clear. Leech and Sugar recorded data on absence of the anterior chamber at the first dressing. De Roeth,[22] in reporting a series of 35 unselected cases, gave statistics for delayed refilling of the anterior chamber but did not mention late loss of the anterior chamber.

### PROLAPSE OF IRIS

Prolapse of the iris occurred on 5 occasions, an incidence of 1.6 per cent. In 1 patient the prolapse occurred on the seventh postoperative day. He became irrational and struck his eye during the night. The wound was broken open, and excision of prolapsed iris and vitreous was necessary. In 1 patient, prolapse of the iris and hyphema developed on the tenth postoperative day when he struck his eye with his fist. There was no vitreous presentation, but iridectomy and closure of the wound were necessary. His final vision was 20/20. One patient, aged 33, had prolapse of the iris on the first postoperative day. This case has already been discussed. In the fourth patient an iris prolapse developed on the first postoperative day. Shortly after she returned from the operating room, an ambulatory patient had an attack of epilepsy outside her room and a relative fainted. This upset the patient considerably and may have contributed to the prolapse. The iris was reposited on the first postoperative day, but the pupil remained slightly notched. The patient's vision is now 20/20. In the fifth case the prolapse occurred without evidence of trauma. The iris was reposited satisfactorily except that the pupil remained notched at 12 o'clock.

None of these patients except the second one had hyphema. Only the first one had prolapse of vitreous with the iris prolapse. All regained normal vision except the first, whose vision on discharge was 20/50. In the last 2 cases the incision was carried into the scleral side of the limbus, and this is believed to have encouraged the prolapse.

Whereas actual incarceration of the wound occurred in only 1.6 per cent of cases, further elaboration is necessary. Of the cases of loss of chamber, it was found that the iris was adherent to the inner surface of the wound in 10 per cent. Grossly this is evident as a slight difference in the depth of the chamber at 6 and 12 o'clock, or there may be a slight drawing up of the pupil. The phenomenon is best seen by means of the gonioscope. It may have occurred in other cases which were not examined gonioscopically. In only 2 of these cases was an elevated tension encountered, and these have been previously described under loss of chamber. In some patients the adhesion involved only a pinhead-sized area. In others the adhesion extended for 30 arc degrees.

### POSTOPERATIVE ASTIGMATISM

One criterion for effectiveness of wound closure is the resultant astigmatism. That a corneal wound is followed by less astigmatism than a scleral wound is evidenced by our observations. All cases in which an accurate refraction could be performed are tabulated. Cases of macular degeneration, retinitis pigmentosa, chorioretinitis, etc., are excluded.

The average corneal astigmatism was 0.92 diopters. Only 6 per cent of our patients had

astigmatism greater than 2 diopters. 2 per cent had 3 diopters of astigmatism, and in no case was the astigmatism greater than 3.5 diopters. So far as we know, this is the lowest incidence of astigmatism in any reported series of cases.

### POSTOPERATIVE UVEITIS

It is difficult to tabulate statistics on the incidence of iritis. Any surgical procedure in which the iris is disturbed by direct or indirect trauma will be followed by some hyperemia of the iris. Furthermore, to make an accurate determination of the incidence of iritis, it would be necessary to examine all patients at the slit lamp daily. This we have not done. It is also difficult with a mature cataract to tell whether postoperative uveitis is an initial inflammation or an acute exacerbation. We have included all cases of postoperative uveitis in which a diagnosis of uveitis was not made preoperatively.

We encountered postoperative uveitis in 12 patients, an incidence of 4 per cent. This includes late uveitis, which may occur several months after operation. When it does so, the onset is usually precipitated by rupture or disintegration of the hyaloid membrane. In 3 cases the eye was not inflamed, but the patient complained of discomfort; slit lamp examination disclosed rupture of the hyaloid with entry of vitreous into the anterior chamber. As a rule, the symptoms promptly subside when the pupil is dilated with a cycloplegic. Four other patients had late uveitis with rupture of the hyaloid membrane, and the inflammation was more severe.

A complicated form of cataract that receives scant attention in the literature is a milky nuclear sclerosis with dustlike vitreous opacities. The visual loss is usually out of proportion to the opacity. Under the best of circumstances, convalescence is slower than with other types of cataract. This is a cataract that must be removed in the capsule. An extracapsular extraction is nearly always associated with postoperative uveitis, and, all too frequently, retinal detachment due to contraction bands in the vitreous.

In 5 cases of acute uveitis the condition was attributed to retained lens cortex after extracapsular extractions. In 3 of these the cataracts were hypermature and in 1 of this group the condition was rather severe. The patient's recovery was complete, and his final vision was 20/20.

### GLAUCOMA

In 2 of our patients postoperative glaucoma developed owing to delayed re-formation of the chamber and the anterior synechiae. Upon 1 patient, who was a diabetic, an iridencleisis was successfully performed. This patient has been under observation for nine months after the iridencleisis. On last inspection her tension was 18 (Schiotz) without mioties. In 1 other patient secondary glaucoma developed but has been successfully controlled with furmethide 10 per cent. On last examination the tension was 16 (Schiotz). Gonioscopic study shows adhesions for about two-fifths of the circumference of the angle. In both of these cases the chamber was shallow or nil for thirteen to fourteen days.

Whenever one must perform a filtering operation on an aphakic eye, the absence of scarring in the subconjunctiva is certainly an advantage. In the absence of prolapsed uveal tissue, capsule, etc., and with an intact vitreous, filtering operations would undoubtedly be more successful were it not for the scarring encountered.

One should have great respect for a shallow or obliterated anterior chamber. Some surgeons find that the use of mioties encourages reformation of the chamber, probably because, in such cases, the iris is partially incarcerated or the vitreous herniated forward. Mioties may present no risk in a quiet eye, but they should be used cautiously in a congested eye. Eserine, particularly, is prone to result in an albuminoid aqueous, which is apt to promote the development of synechiae.

In principle, injection of air to restore the chamber several days after the operation seems sound. We feel, however, that the danger of infection is too great and do not recommend it.

### OTHER COMPLICATIONS

No case of infection, detachment of the retina, expulsive hemorrhage or corneal dystrophy was encountered. However, few of these patients have been followed for longer than a year; therefore, the absence of such

complications as retinal detachment permits no conclusions.

### VISUAL RESULTS

The visual results with this technic have been most gratifying. Excluding cases in which extraneous conditions accounted for diminished vision, vision of 20/30 or better was obtained in 97 per cent. The main cause of poor vision was uveitis with development of a cyclitic membrane or prolapse of cloudy vitreous into the anterior chamber. The poorest vision in this series was 20/70. Of course, there were many cases of diabetic retinopathy, central choroiditis, senile macular degeneration, retinitis pigmentosa, etc., in which we could not hope to obtain normal vision. When all cases were included, regardless of the underlying pathologic conditions, vision of 20/30 or better was obtained in 85 per cent of the entire series.

### SUMMARY AND CONCLUSIONS

A technic is described for the operative treatment of cataract, in which the incision is made in clear cornea with preplaced sutures. The advantages of such an incision are: (*a*) hyphema is reduced in incidence and when it does occur is never severe; (*b*) there is even less corneal astigmatism than when corneoscleral sutures are used; (*c*) prolapse of the iris is also infrequent, and (*d*) if secondary glaucoma occurs, an undisturbed subconjunctival tissue increases the chances for a successful filtering operation.

The disadvantage of such an incision would seem to be that healing of the wound is not as secure. This conclusion is based on the incidence of partial or complete loss of the anterior chamber. However, it is possible that we have been too critical in our statistics, since any anomaly of the depth of the anterior chamber was included as abnormal. In addition, we feel that such an abnormal chamber is not necessarily a criterion of effectivness of wound closure. In most of these cases no leakage of the wound could be demonstrated. It is quite possible that the vitreous and particularly the hyaloid membrane may play a role in preventing communication between the anterior and posterior chambers.

Recently we have modified our technic so that the knife incision is placed obliquely to the surface of the cornea and have performed two iridotomies instead of one. The results with this modification are very encouraging, but a sufficient number has not been performed to draw any conclusions.

The ideal closure for cataract operations is yet to be described. Corneal incisions as herein described offer certain advantages over corneoscleral incisions. It is hoped that this presentation will encourage others to experiment further with corneal incisions.

### RÉSUMÉ ET CONCLUSIONS

On décrit une technique de traitement opératoire de la cataracte, dans laquelle l'incision est pratiquée dans une cornée transparente dont les sutures ont été préparées en avance. Les avantages de cette incision sont que: a) l'hyphémie est arrêtée si elle survient, et quand elle apparait, elle n'est jamais grave; b) il y a moins d'astigmatisme cornéal que lorsqu'on se sert des sutures cornéosclérales; c) le prolapsus de l'iris est aussi peu fréquent, et d) si un glaucome secondaire survient, un tissu sous-conjonctival, que l'on a respecté, augmente les chances de succès d'une opération destinée à permettre le passage de la vision.

L'inconvénient d'une telle incision pourrait être que la cicatrisation de la plaie n'est pas aussi sûre. Cette conclusion s'appuie sur la possibilité d'une perte partielle ou complète de la chambre antérieure. Cependant, il est possible que nous ayons été trop sévère dans nos statistiques, du fait, que toute anomalie dans les dimensions de la chambre antérieure fut considérée comme anormale. De plus, nous estimons qu'une telle chambre anormale n'est pas nécessairement un critère pour la réalisation de la fermeture de la plaie. Dans beaucoup de ces cas on n'a pu trouver de suintement de la plaie. Il est fort possible que la vitrée et, particulièrement la membrane hyaloïde puissent jouer un rôle en empêchant la communication entre les chambres antérieures et postérieures.

Récemment nous avons modifié notre technique de telle façon que l'incision du couteau soit faite obliquement à la surface de la cornée et puisse accomplir deux iridotomies au lieu d'une. Les résultats obtenus par cette modification sont très encourageants, mais nous

n'en avons pas pratiqué un nombre suffisant pour en tirer quelques conclusions valables.

La fermeture idéale pour les opérations de cataracte attend toujours d'être décrite. Les incisions cornéennes telles que nous les avons décrites, nous offrent certains avantages sur les incision cornéosclérales. Nous espérons que ce travail encouragera d'autres chirurgiens à pousser plus loin leurs expériences des incisions cornéennes.

RESUMEN Y CONCLUSIONES

Se describe una técnica para el tratamiento operatorio de la catarata en la que se realiza una incisión en la córnea que tiene las siguientes ventajas: a) se reduce la frecuencia del hipema y si se presenta, nunca es grave; b) se produce menos astigmatismo corneal que cuando se usan suturas córneoesclerales; c) es también poco frecuente el prolapso del iris; y d) si se desarrolla glaucoma, al no estar alterado el tejido subconjuntival ello aumenta las probabilidades de que la operación de filtración tenga un resultado satisfactorio. Las desventajas de dicha incisión parecen ser que la curación de la herida no es tan segura, basándose esta conclusión en la frecuencia con que acaece la pérdida parcial o total de la cámara anterior. Es posible que se haya sido excesivamente crítico en el juicio de las estadísticas, en las que se incluyeron como anormales cualquier anomalía de la profundidad de dicha cámara anterior. Por añadidura, la existencia de una cámara anormal no es necesariamente un requisito en el que poder basar la efectividad del cierre de la herida. En la mayoría de los casos no puede demostrarse la existencia de alteraciones en el cierre de la herida, siendo posible que el cuerpo vítreo y especialmente la membrana hialoide desempeñen un papel en la prevención del desarrollo de una comunicación entre las cámaras anterior y posterior.

Recientemente se ha modificado esta técnica para que la incisión se realice de un modo oblícuo a la superficie de la córnea, habiéndose realizado dos iridotomías en lugar de una sola. Los resultados con esta modificación son muy alentadores, si bien todavía no se han intervenido un número suficiente de casos para poder llegar a deducir ninguna conclusión.

Todavía no se ha descrito el cierre ideal de la herida en la operación para el tratamiento de las cataratas. Las incisiones corneales aquí descritas presentan ciertas ventajas sobre las incisiones córneoesclerales, confiándose que este artículo estimule a otros autores a seguir experimentando con las incisiones corneales.

RIASSUNTO

Descrive un metodo operatorio per la cura della cateratta, che si basa sopra un'incisione condotta direttamente sopra la cornea, con suture preposte. I vantaggi di quest 'incisione consisterebbero: a) nella minore frequenza di enorragie nella camera anteriore e—qualora presenti—in una loro minore intensita': b) in un minore astigmatismo della cornea in confronto alle suture corneoscleroidee: c) in una minore frequenza anche di un prolasso dell'iride: d) in una migliore prognosi operatoria (per filtrazione) qualora insorga un glaucoma secondario, dato che il tessuto sottocongiuntivale non viene disturbato dalla prima operazione per cateratta.

Un'obbiezione a questo metodo sembra derivare dall 'incostanza di una perfetta chiusura della ferita, e con cio', dalla frequenza di una parziale o completa perdita della camera anteriore. Ma una camera anteriore anormale non rappresenta necessariamente un criterio per giudicare la perfezione di guarigione della ferita. Nella maggioranza dei casi l'A. non ha riscontrato una permeabilita' della ferita Puo' darsi che il vitreo e specialmente la membrana ialoidea esercitino una funzione importante nel prevenire una comunicazione fra camera anteriore e posteriore.

Negli ultimi tempi l'A. ha modificato la tecnica operatoria, nel senso che l'incisione sulla superficie della cornea viene condotta in senso obliquo, mentre viene eseguita una doppia iridotomia. I risultati sembrano incoraggianti: ma il numero delle operazioni così eseguite non e' sufficiente per autorizzare delle conclusioni definitive.

L'A. conclude invitando altri specialisti aol operare le cateratte con un'incisione corneale invece delle solite incisioni corneo-sclerali.

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# Tantalum Gauze Repair of Incisional Hernia

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TANTALUM is a dull, grey, relatively inert, heavy metal having an atomic weight of 181.4. During the recent war it proved its adaptability for use in skull plates and nerve sheaths and also as suture material. During the past year five reports have appeared in the literature describing its use as an adjunct in the repair of hernia in the absence of adequate tissues. For hernia repair tantalum is used as a fine screen composed of wire 0.003 inch in diameter, woven in 50-50 mesh. Since the metal provokes no foreign body reaction, it may be left in place permanently, even in the presence of infection.

The first use of tantalum gauze in hernia repair was made by Ferris[1] at the Mayo Clinic. Since then 53 assorted hernias have been repaired successfully and presented in the literature. Throckmorton[2] reported 15 cases, 2 of ventral, 12 of inguinal, and 1 of obturator hernia. In 1 case healing was firm and normal despite postoperative wound infection. Koontz[3] reported 5 cases of ventral hernia. Jefferson and Dailey[4] described a ventral hernia with insufficient tissue for closure, successfully repaired with a double thickness of tantalum gauze. In 32 unitemized cases, Douglas[5] had no failures. He stated that, in experimental animals, implanted gauze is so firmly infiltrated by fibrous tissue that it can be removed only by digestion of the connective tissue with proteolytic enzymes. Tantalum, on the other hand, was completely unchanged by implantation.

## REPORT OF CASES

*Case 1*—Mrs. A. E., a 38-year-old white woman, presented herself at this clinic on July 31, 1948, with a ventral hernia of twelve years' duration. The hernia had followed a pelvic operation. Since then she had undergone five operative repairs by various surgeons. On each occasion the hernia recurred before she left the hospital or shortly after.

Although obese, the patient was apparently in good health except for a large, flat hernia that extended 4 inches to the left and 2 inches to the right of the midline below the umbilicus. Just under the umbilicus there was a defect in the abdominal wall that would admit four fingers of the examining hand. Laboratory examination revealed no abnormality except a 4 plus reaction for sugar in the urine and a fasting blood sugar value of 299 mg. per hundred cubic centimeters. Under care of Dr. Harold J. Morris, she was admitted to the hospital for control of her diabetes. After she had been sugar-free for several days, operation was performed. A large hernial sac of about 1-quart capacity was found spread out under the skin and opening into a defect about 2 inches in diameter in the abdominal wall just below the umbilicus. The sac was freed with difficulty, as were the muscles and fascia. The sac was excised and the hernia repaired by imbrication of the fascia with interrupted cotton sutures. Over the fascia a sheet of tantalum gauze 6 x 6 inches, with ¼ inch of the edges folded under, was sewn with interrupted sutures of No. 0.005 tantalum wire, without tension. The skin was closed with interrupted cotton sutures. Recovery was uneventful, and on the eleventh postoperative day (Aug. 24, 1948) the patient was discharged, a diabetic diet and insulin having been ordered. On August 28 the wound was healed. A small raised area was noted in the left inguinal region and was thought to be scar tissue. On September 11 the weight of her pendulous abdomen had wrinkled the gauze, producing unsightly lumps, but there was no sign of recurrence. She was advised to wear a hernia belt for six months, which soon reflattened the gauze. On October 6 the value for blood sugar was 124 mg. per hundred cubic centimeters. At the time of writing she "feels fine."

*Case 2*—Mrs. M.S., a 49-year-old white woman, presented herself at the clinic July 26, 1948, complaining of a huge abdominal hernia. She had been operated on ten years earlier for "intestinal prolapse," after which she had a wound infection and subsequently a hernia. The hernia became larger as time passed. The patient was small but obese, with a huge saclike mass between the umbilicus and the pubis. It was approximately the size of a football and was completely reducible. At the apex of the sac was an indolent ulcer the size of a five-cent piece. Examination otherwise re-

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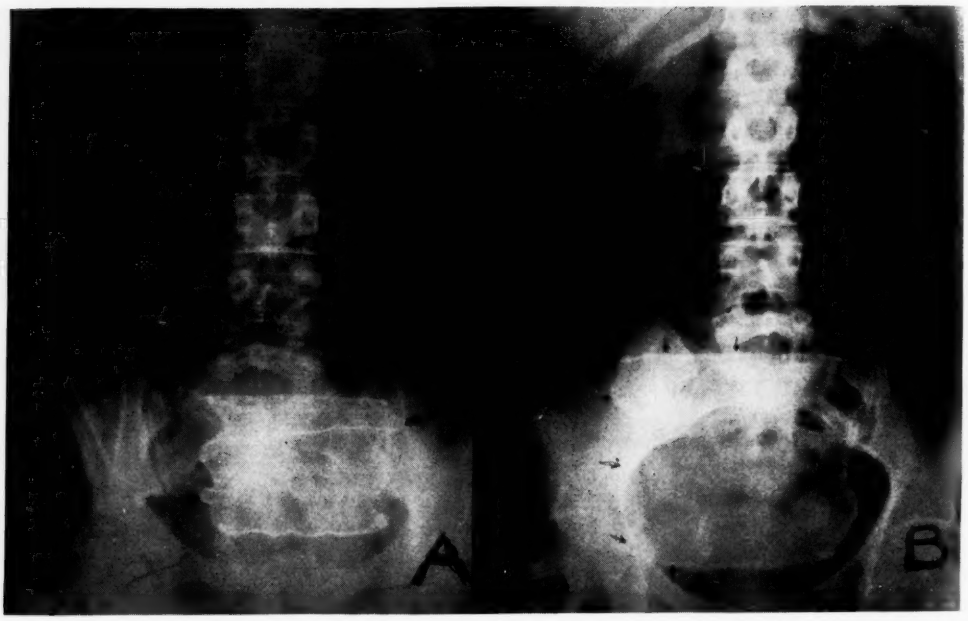


Fig. 1. (Case 1).—*A*, folding of the gauze that produced "lumps" on the patient's abdomen. *B*, tantalum gauze in place just after the patient's discharge from the hospital.

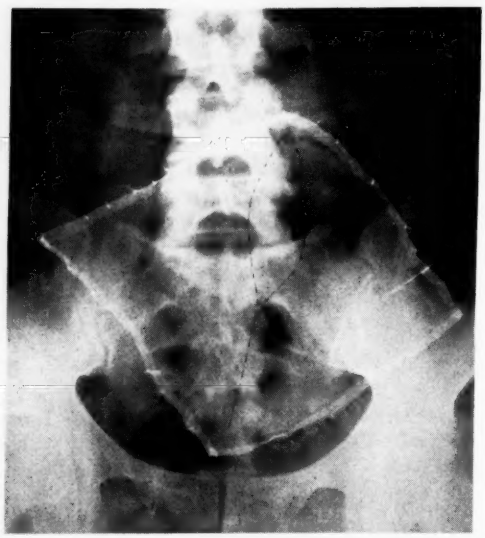

Fig. 2. (Case 2). Roentgen film of abdomen after operation, showing the gauze in place. It was necessary to turn the square diagonally in order to cover the defect properly. This is indicated by the dotted line drawn on the film.

vealed no abnormality. She was hospitalized, and on August 10 the hernia was repaired. Just under the skin was a huge sac of approximately 2-quart capacity, filled with bowel. The muscles were completely buried in scar tissue, and the fascia ended at about the center of the muscle bellies. As much of the muscle as possible was freed, but still left a defect about 2½ x 1½ inches which it was impossible to close. In order to protect the bowel from the gauze and to help fill the dead space, the sac was not excised but was inverted and the muscles approximated as far as possible with No. 0 chromic catgut. A square of tantalum gauze measuring 6 x 6 inches, with the edges folded under, was sutured over the defect with as little tension as possible, with interrupted sutures of No. 0.005 tantalum wire. The skin was then closed with interrupted cotton sutures. A small Penrose drain was left in the lower end of the incision just under the skin, and was removed after twenty-four hours.

Postoperatively the patient showed a mild wound infection which, on culture, yielded clusters of gram-positive cocci. Under chemotherapeutic measures this cleared up in a few days, and on the twentieth postoperative day the patient was sent home. Her abdomen was completely healed except for a small sinus at the middle of the scar. This

drained until it healed on November 2. She was discharged at that time, there was no sign of recurrence four months after the operation. She was provided with a ventral hernia belt on discharge from the hospital, with instructions to wear it for six months.

## SUMMARY AND CONCLUSIONS

This paper presents a review of the literature on the use of tantalum gauze in the repair of incisional hernia, adding 2 new cases. The first case is of special interest, since, as far as can be determined, it represents the first use of this material in a diabetic patient, for whom it has proved not only innocuous but apparently valuable. Also of interest are the lumps produced by the bending of the gauze, which were subsequently smoothed out by the use of a hernia belt.

The second case adds evidence of the efficacy of this material in the presence of infection and in the absence of adequate tissue to cover the defect properly. Tantalum gauze is proving itself to be a most valuable addition to the armamentarium of the progressive surgeon.

## RIASSUNTO

Passa in rassegna la letteratura sopra l'uso di garze di tantalo nelle operazioni per ernie laparatomiche. Aggiunge due casi operati personalmente. Il primo e' interessante, perche' occorso in un diabetico. Il nuovo materiale plastico e' riuscito non solo innocuo, ma utilissimo per il riparo dell'ernia. I noduli provocati dalle pieghe della garza sono stati successivamente appianati dall'uso di un cinto erniario.

Il secondo caso dimostra l'efficacia del materiale plastico anche in presenza di infezioni ed allorquando manchino tessuti sufficienti per ricoprire adeguatamente il difetto.

Le garze di tantalo rappresentano quindi un'utilissima aggiunta all'armamentario del chirurgo moderno.

## SUMARIO

Este articulo presenta una revista de la literatura sobre el uso de la gasa de tántalo en el tratamiento de las hernias incisionales, agregando dos casos nuevos. El primer caso es de interés especial, por cuanto aparentemente y según la literatura, es el primero en que se ha usado dicho material en un paciente con diabetes. En este paciente su uso fue innocuo y aparentemente de valor. También es de interés porque fue posible desplegar las masas formadas por la gasa con el uso de la correa hernial.

El segundo caso atestigua aún más la eficiencia de este material en casos complicados por infección o por la falta de tejido suficiente para cubrir el defecto completamente. La gasa de tántalo está probando ser una de las adiciones más valiosas del arsenae quirúrgico.

## RÉSUMÉ ET CONCLUSIONS

Cet article nous présente une revue des travaux faits sur l'emploi de la gaze de tantale pour réparer une hernie de la cicatrice, en ajoutant deux cas nouveaux. Le premier cas présente un intérêt particulier parce que, autant qu'on peut le préciser, il représente la première utilisation de ce matériel chez un malade diabétique pour lequel il s'est montré non seulement inoffensif mais apparemment d'une certaine valeur. Les saillies produites par le bombement de la gaze sont d' un certain intérêt, car elles furent ultérieurement réduites par l'emploi d'un bandage herniaire.

Le second cas montre l'évidence de l'efficacité de ce matériel en présence d'une infection et en l'absence d'un tissu approprié pour couvrir véritablement la partie défectueuse. La gaze de tantale s'est démontré comme étant d'une certaine valeur et qu'il fallait l'ajouter à l'arsenal thérapeutique du chirurgien très averti.

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# The Problem of Bronchogenic Carcinoma

## Review of Literature and Statistical Study of Sixteen Cases

ADOLPH M. MALLER, M.D., A.I.C.S.
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ALTHOUGH bronchogenic carcinoma was virtually unknown twenty-five years ago, it is today recognized as an important clinical entity. It is striking indeed that the *Quarterly Cumulative Index Medicus* registered but one reference on cancer of the lung in 1920. Bayle[1] in 1810 was apparently the first to describe this malady. In 1912, Adler's[2] monograph "Primary Malignant Growths of the Lungs and Bronchi" began as follows: "Is it worth while to write a monograph on the subject of primary malignant tumors of the lung?" He further stated, ". . . there is nearly complete consensus of opinion . . . that primary malignant neoplasms of the lungs are among the rarest forms of disease." Holmes and Ruggles[3] in 1926 observed, "Primary malignancy of the lung is rare."

Today, however, this type of carcinoma is so common that it arises at once in the mind of the medical student when he encounters a patient with pulmonary symptoms. Indeed, in patients of the cancer age presenting signs and symptoms of pulmonary disease that offer diagnostic difficulties, primary carcinoma of the lung is always considered a diagnostic possibility.

It has been estimated that approximately 15,000 persons die annually in the United States of bronchogenic carcinoma.[4] During the year 1940, according to the U. S. Government Report, this condition was the cause of 5,556 deaths. Per 100 000 of population, the death rate was 1.1 in 1920, 2.2 in 1930 and 4 in 1940.[5] It would appear, therefore, that cancer of the lung constitutes about 1 per cent of all cases of malignant disease observed at autopsy, and more than 8 percent of all cases of malignant disease discovered post mortem.[6]

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From a position of obscurity a quarter of a century ago, pulmonary carcinoma has risen to such prominence that investigators have rated the lung second in frequency only to the stomach as a primary site of malignant growth. Recently, statistical studies at St. Louis City Hospital[7] and at the Charity Hospital in New Orleans[8] have shown that primary carcinoma of the lung is actually more frequent than primary carcinoma of the stomach.

The recent increase in bronchogenic carcinoma may be apparent or real or both. A study of the literature suggests that the greater part of the increase is apparent, but no one is prepared to state that none of it is real.

Ochsner and DeBakey[9] stated that pulmonary carcinoma is definitely increasing. This was confirmed by Rosahn,[10] who found that the ratio of pulmonary carcinoma to all carcinoma at Yale University Medical School rose from 7.4 per cent for the period from 1917 to 1927 to 11 per cent for the years 1928 to 1937. Jaffe[11] and Steiner[12] expressed the opinion that the increase in frequency is more apparent that real. Klotz,[13] from a detailed review of the literature, concluded, "Most authors consider the increase purely apparent."

This problem has broad implications. If the increase in pulmonary carcinoma is merely an expression of the aging of a population provided with improved diagnostic facilities and sharper clinical acumen, little can be done by way of prophylaxis. On the other hand, if the increase is greater than can be expected on the basis of increasing numbers of persons in the older age groups, greater even than can be ascribed to modern and accurate diagnostic methods, attention can be directed to the elucidation and perhaps the ultimate elimination of the possible causative factor or factors.[10]

In rationalizing the apparent increase of primary carcinoma of the lung, Peery[14] con-

cluded that prior to 1900 this tumor was diagnosed less often because of the current belief that it was exceedingly rare and that when it did occur it was usually metastatic. He expressed the opinion that bronchogenic carcinoma is diagnosed more frequently today than is justified. Involvement of the bronchial mucosa, which is generally considered one of the diagnostic criteria, is not reliable, since metastases to the bronchial mucosa are relatively common. The abandonment of such diagnoses as "endothelioma of the pleura," "oat-cell tumor of the mediastinum" and "tumor of the superior pulmonary sulcus" and the placing of all tumors formerly designated by these terms in classification of "primary carcinoma of the lung" have swollen the statistics rather than increased the incidence of the disease. Fried[15] pointed out that, progress in public health having resulted in increased longevity, more people are naturally reaching the "cancer age."

Rosahn[16] analyzed 435 carcinomas of the lung in 425 different persons observed in a series of 4,114 autopsies at Yale University between 1917 and 1937. He concluded (*a*) that the increased incidence is due to improved clinical and pathologic methods of diagnosis; (*b*) that increased attention has been drawn to this malady; (*c*) that tumors once classified by pathologists as sarcomas are now classified as epithelial tumors of the oat-cell variety; (*d*) that, formerly, carcinoma of the lung was usually considered metastatic; and (*e*) that widespread interest on the part of pathologists has led to the discovery of small pulmonary neoplasms with large metastases, which observers had formerly considered primary lesions. On checking the *Index Medicus* for the past twenty years, it is readily apparent that reports on various aspects of carcinoma have increased tremendously; but what is important is that carcinoma of practically every organ, not of the lung alone, is represented by an increasing number of publications.

If one compares the mortality statistics on miners in Schneeberg, Germany, before and after 1922, one is confronted with a remarkable phenomenon.[16] Prior to 1922 most of the deaths were caused by tuberculosis or silicosis, and after 1922 the majority (71 per cent, to be exact) were due to bronchogenic carcinoma. It had been known for four hundred years that the miners in Schneeberg suffered from a wasting, progressive pulmonary disease, but it was only in 1922 that a commission headed by Schmorl[17] showed this mysterious disease to be none other than bronchogenic carcinoma. Obviously, it is safe to conclude that, when one's eyes are opened to the true nature of a disease, recognition of a very much larger number of cases must follow.

## ETIOLOGIC CONSIDERATIONS

The cause of bronchogenic carcinoma is still undetermined. It is interesting to note that the rise in incidence of this neoplasm has been concomitant with the development of the "machine age." In an exhaustive review of the literature, Simons[18] mentioned no fewer than fourteen different predisposing factors. Wegelin[19] distinguished exogenous and endogenous etiologic factors. Definite knowledge concerning the relation of heredity to pulmonary cancer in man is lacking, but it may be that a hereditary predisposition becomes manifest when external noxae are operative in addition.

Exogenous factors in the form of irritants of the bronchial epithelium (and perhaps the lung tissue) are contributory, since they cause acute or chronic inflammation and epithelial metaplasia, which are precursors of cancer. Suspicion has been directed against automobile exhaust gases and the tarring of roads; but the disease is as prevalent in the great open spaces, where the roads are untarred and there are few automobiles, as it is in large cities; nor has the incidence been shown to be higher among garage workers than among others. Cigarette smoking has been incriminated because of the predominant involvement of the male sex, but the increase of female smokers has not led to an increase in the number of pulmonary cancers in women. The influenza epidemic of 1918 used to be blamed for the increased frequency. Tuberculosis cannot be considered a frequent etiologic factor, although carcinoma may develop from the walls of old tuberculous cavities lined with regenerated metaplastic pavement epithelium, or from tuberculous scars close to the pleura. Of facts supposedly related to the cause of the disease, the only one of real significance is the "Schneeberg lung cancer" due to radon emana-

tions. It has been shown that persons living in the Schneeberg district but not engaged in the mines suffered from bronchogenic carcinoma to a much lesser degree than did the miners.

One may conclude, therefore, that knowledge of the etiologic factors is still limited and not well founded; probably both hereditary and acquired disposition and external irritants play a role.

## INCIDENCE

Bronchogenic carcinoma is more prevalent in the male than in the female. Ochsner, DeBakey and Dixon[20] in a series of 412 cases, reported 356 (86.4 per cent of the tumors as occurring in men and 56 (13.6 per cent) in women. In a review of 2,047 cases from the available literature, Fried[21] noted that 82.9 per cent of the patients were men and 17.1 per cent were women. This peculiar predilection for the male sex has not been adequately explained. In a group of 16 cases under my own observation, 8 of the patients were male and 8 were female.

The age incidence for bronchogenic cancer is the same as for carcinoma of other organs. In 166 cases studied by Ochsner, Dixon and DeBakey,[22] the following age incidences were noted: second decade, 3.8 per cent; third decade, 1.9 per cent; fourth decade, 9.6 per cent; fifth decade, 26.9 per cent; sixth decade, 38.5 per cent; seventh decade, 17.3 per cent; and eighth decade, 1.9 per cent. The ages of the patients ranged from 19 to 72. More than 80 per cent of Halpert's[23] patients were in the sixth decade or older.

The age incidence in my group of 16 patients is given in Table 1.

TABLE 1.—*Age Incidence of Bronchogenic Cancer*

| Age | Number of Cases | Percent |
|---|---|---|
| 40-49 | 2 | 12.5 |
| 50-59 | 8 | 50.0 |
| 60-69 | 3 | 18.3 |
| 70-79 | 3 | 18.3 |

The average age of the male patients was 58 years; that of the female patients, 60 years.

According to opinions now prevailing, practically all cancers of the lung arise in bronchial tissue. Bronchogenic cancer shows a distinct predilection for the right bronchus. This is generally attributed to the more direct course and greater diameter of the right bronchus, a greater total surface area being exposed to irritation. Holinger,[24] in an analysis of 175 cases, found that the neoplasm occurred on the right in 111 cases, on the left in 60 cases; in 4 cases it was bilateral. Fifty-five of the tumors on the right side were in the primary bronchus within 1 to 2 cm. of the carina; 19 at the orifice of the upper lobe bronchus; 2 at the orifice of the middle lobe, and 32 in the lower lobe bronchus. Of the 60 growths originating on the left side, 20 were in the primary bronchus, 15 at the opening of the upper lobe and 23 in some portion of the lower lobe bronchus. In 4 cases the neoplasm had originated near the bifurcation and involved both bronchi. Peripheral growths were observed in 3 cases on the right and in 2 on the left side. In 343 cases studied by Hollingsworth,[25] 203, or 59.2 per cent, of the tumors were located on the right side, and 138, or 40.2 per cent, on the left; in 2 cases, or 0.6 per cent, there was bilateral involvement. In my own group of 16 cases, the distribution was even between the right and the left lung. The incidence for males was 62.5 per cent and that for females 37.5 per cent on the right. The converse was observed for the left-sided lesions.

Pathologists have distinguished macroscopic types ranging from three to five in number. Thus, Jaffe[11] identifies four types, and Frissell and Knox[26] recognize five. It might be better to distinguish two types, which occur with almost equal frequency. One type grows chiefly outward, spreading through the bronchial wall into peribronchial tissue, whereas the other type grows predominantly into the lumen of the bronchus.

## PATHOLOGIC PICTURE

Histogenically, bronchogenic carcinoma has been divided into three groups, according to the epithelial units ascribed to the lungs: (*a*) bronchial epithelium, (*b*) the epithelium that forms the mucous glands and (*c*) the epithelium that lines the pulmonary alveoli. New

burger and Geever[27] expressed the opinion that there is little evidence that bronchogenic neoplasms are ever derived from the alveolar epithelium.

The microscopic picture will point to the histogenesis only in exceptional cases, since the morphologic character of the neoplastic cells varies from one tumor to another. Even in the same tumor the picture may vary from area to area.

Although, histologically speaking, bronchogenic carcinoma possesses a large degree of pleomorphism, certain cellular types predominate, and a microscopic classification would include (*a*) squamous cell carcinoma, (*b*) adenocarcinoma and (*c*) undifferentiated cell carcinoma, which has been called by others "small cell," "round cell," or "oat cell" carcinoma. Cancer with undifferentiated cells has often been diagnosed as sarcoma, lymphosarcoma, round cell sarcoma, oat cell sarcoma or endothelioma. It is generally agreed that primary squamous cell carcinoma of the lung does not result from metaplasia of pre-existing ciliated columnar epithelium but originates through metaplasia of the undifferentiated basal cells of the bronchial mucous membrane. Koletsky[28] in analyzing 100 cases of primary carcinoma of the lung, identified 35 small cell carcinomas, 40 squamous cell carcinomas, 22 adenocarcinomas and 3 tumors classified as carcinoma simplex. Holinger, Hara and Hirsch,[24] in reporting 175 cases, stated that 64 per cent were squamous cell carcinomas, 17 per cent small round cell carcinomas, 6 per cent adenocarcinomas. Analysis of the 16 cases here reported reveals 8 squamous cell carcinomas, 6 undifferentiated cell carcinomas and 2 adenocarcinomas.

In a report of 216 patients, Gebauer[29] brought out the fact that there exists a clinicopathologic differentiation among the various microscopic forms In his series, 66 per cent of small cell carcinomas arose in the main stem bronchi. The remainder frequently began near the orifice of a secondary bronchi, but rarely arose in a small branch bronchus. The formation of an irregular mediastinal mass is characteristic of this centrally located and rapidly growing tumor. It is highly invasive, extends along the bronchus, and surrounds it and the neighboring structures with firm tumor tissue. This process is accompanied by a nonselective invasion of the adjacent lung. Involvement of the pulmonary parenchyma, however, is less conspicuous than mediastinal extension, the neoplasm being vigorously metastatic to adjacent, regional and distant lymph nodes.

Adenocarcinomas arose in secondary branches, such as the lobar stems, in 70 per cent of Gebauer's cases. Twenty per cent began in small branch bronchi and 10 per cent in the main branch. The central extension of this tumor is less striking than its peripheral growth, which follows the bronchial and vascular channels. Its rapidity of growth varies somewhat with the degree of cellular differentiation but is less marked than that of the small cell tumors. Because of its tendency to arise in secondary bronchi and small branch bronchi, it may form a well circumscribed mass that replaces pulmonary parenchyma and appears as a nodule within the lung. There may be diffuse involvement of the mediastinal lymph nodes, with the formation of irregular masses. Involvement of the peripheral lymphatics may induce pleural effusion.

Squamous cell carcinoma originates, in 70 per cent of all cases, in the first branches of the main stem bronchi. It grows more slowly than either of the aforementioned two types, and it affects older persons. Local growth of the primary tumor results in the formation of a nodular mass about the bronchus of origin. This mass has a tendency to control necrosis and cavitation. It extends centrally along the bronchus, causing fixation and constriction of this structure. This extension is not by way of the lymphatics, and, although it is invasive, it seems to avoid the lymph nodes. It is extrabronchial in its proximal portion, so that the lumen of the constricted bronchus may reveal mucosal tumor only deep within the entire mass. Peripheral growth of the mass is likewise invasive. Tumors of the upper lobe are prone to extend into the upper thoracic aperture or into the chest wall. In general, metastasis occurs late and even then not as extensively as from small cell carcinoma or adenocarcinoma. In contrast to these two types, the squamous cell tumor exhibits cavitations in more than 50 per cent of cases observed at autopsy. It usually connects with the involved bronchus,

and it occupies the center of the peripheral tumor mass.

Moore,[30] in describing the mierscopic pictures of the various forms, stated that the individual tumor cells of the small cell carcinoma, frequently called oat cell carcinoma, may be either round or spindle-shaped and are collected into small or large masses. These masses are completely devoid of reticulin fibers, which establishes the tumor as a carcinoma and not a sarcoma. Adenocarcinomatous cells are cuboidal or low columnar and are arranged for the most part in an acinic form. The cells of squamous cell carcinoma are polygonal, show intercellular bridges, and are frequently arranged in whorls, some of which are keratinized to form the characteristic epithelial pearl.

All of the elements of the lung not invaded by tumor growth are damaged secondarily. Obstructive atelectasis and emphysema occur as a result of partially and eventually complete occlusion of the bronchus. In many cases atelectasis is an early sign pointing to the presence of bronchial occlusion. It is often complicated by infection, with abscess formation and bronchiectasis. Damage to the bronchi, consisting of degenerative and metaplastic changes of the mucous membrane and an organizing type of pneumonitis, may cause obliterating bronchitis and bronchiolitis. Other pulmonary complications are localized pneumonic infiltration, effusion, empyema, gangrene, and hemorrhage due to erosion of blood vessels.

## METASTASIS

Metastasis from primary carcinoma occurs by direct extension, lymphatic spread to regional lymph nodes and hematogenous spread to distant organs. Owing to the richness of the pulmonary circulation, dissemination in the blood takes place relatively early, and metastases occur in widely separated regions of the body. Lumsden[31] described an additional mode of metastasis, "bronchial embolism," a surface spread that may explain peripheral involvement of the lung when the primary lesion is proximal. Metastases from primary carcinoma of the lung are frequently multiple, and their distribution is wide. Table 2 shows the distribution of metastases in the present group of cases.

TABLE 2.—*Distribution of Metastases in a Series of 16 Cases*

| Organ | Number | Per Cent |
|---|---|---|
| Hilar lymph nodes | 14 | 87.5 |
| Adrenal glands | 7 | 43.75 |
| Pleura | 6 | 37.5 |
| Liver | 5 | 31.25 |
| Peribronchial lymph nodes | 4 | 25 |
| Kidneys | 4 | 25 |
| Brain | 3 | 18.75 |
| Skeleton | 2 | 12.5 |
| Contralateral lung | 2 | 12.5 |
| Heart and pericardium | 1 | 6.25 |
| Spleen | 1 | 6.25 |
| Mesentery | 1 | 6.25 |
| Cervical lymph nodes | 1 | 6.25 |
| Abdominal lymph nodes | 1 | 6.25 |
| Skin | 1 | 6.25 |
| Pancreas | 1 | 6.25 |
| Thyroid | 1 | 6.25 |

In 2,579 cases collected from the literature, Ochsner and DeBakey[32] observed metastases to the regional lymph nodes in 75.9 per cent; to the liver, in 34.4 per cent; to the bones, in 20.4 per cent to the adrenal glands, in 17.4 per cent; to the kidneys, in 16 per cent; to the heart and pericardium, in 10 per cent, and to the pancreas, in 5.1 per cent. As was to be expected, the regional hilar lymph nodes were most frequently involved. Frissel and Knox[26] observed metastases invading the hilar lymph nodes in 97.4 per cent of cases. Boyd[33] stated that the natural history of the disease as shown by distant spread my be so characteristic as to suggest the correct diagnosis. The six most common sites of metastasis are the lymph nodes, the liver, the brain, the bones, the adrenal glands and the kidneys. When an adult is seen at autopsy to have tumors of the lung, brain and adrenal glands, a diagnosis of bronchogenic carcinoma may be made. In Boyd's experience, 50 per cent of adrenal secondary carcinomas have a pulmonary origin, the other 50 per cent including every other site of primary carcinoma.

## SYMPTOMS

Unfortunately, the onset of primary carcinoma of the lung is insidious in most

cases. Manifestation of the disease is chiefly respiratory or due to extrapleural disturbances resulting from metastases; or the tumor may remain silent until it has reached an advanced stage. In about 98 per cent of cases the symptoms are referable to the chest.[34] A cough is the earliest manifestation. It may be productive or nonproductive. It is often regarded lightly by both patient and physician because of its frequency in other chest conditions. If it is productive, the gross appearance of the sputum is not characteristic, but not infrequently the sputum is streaked with blood. Bright red blood in small quantities may be noted, but large hemoptyses are rare. A wheezing sound on one side of the chest may be noted by the patient. This is due to partial occlusion of the bronchus and may disappear when the occlusion becomes complete. Too often a wheeze accompanied by cough and dyspnea is mistaken for asthma. Pain may be insignificant in the early stages, but later, in the moderate and advanced phases, it will occur. It has been described as persistent, sharp and stabbing, and is due to involvement of the pleura, both as pleuritis and as metastatic involvement. The position of the tumor, rather than its size, accounts for its role in the causation of dyspnea. This may be due to a large pleural effusion, massive atelectasis due to the plugging of a large bronchus, or interference with respiration and circulation due to obstructive growth of the tumor circumferentially around the bronchi and blood vessels.

Cyanosis may appear in a fair percentage of cases. Its occurrence depends largely upon the topography of the tumor, not alone upon its size. Pressure on the vena cava aggravates this cyanosis. Fever is observed in a fairly large porportion of cases and tends to be of a low grade early in the disease. Later on, when bronchiectasis, secondary infection of cavities or pulmonary gangrene supervenes, high temperatures may be reached. Loss of weight is not a prominent symptom and does not appear until the disease has reached a late stage. When it occurs, it is not as pronounced as with cancer of the gastrointestinal tract. Pleural effusion is more common in tumor of the lower lobe than in involvement of the upper lobe. It occurs because of pleural metastases or collapse of the lung due to bronchial occlusion. Table 3 lists the symptoms noted in this group of 16 cases.

TABLE 3.—*Distribution of Symptoms in a Series of 16 Cases*

| Symptoms | Number | Per Cent |
|---|---|---|
| Persistent cough | 13 | 81.3 |
| Hemoptysis | 3 | 18.7 |
| Pain in the chest | 10 | 62.5 |
| Dyspnea | 10 | 62.5 |
| Cyanosis | 5 | 31.3 |
| Fever | 11 | 68.7 |
| Loss of weight | 12 | 75.0 |
| Pleural effusion | 5 | 31.3 |

Because of the paucity of the symptoms, particularly in the early stages, and the insidious onset, many patients unfortunately are examined too late. The fault is partly the patient's own; frequently he explains his cough as due to smoking. Only too frequently the patient and even the physician do not consider the significance of a respiratory infection that does not clear up completely, and several months may elapse before proper studies are made. It can readily be seen from Table 4 that in the majority of the cases here reported too much time was permitted to elapse before diagnosis of bronchogenic carcinoma was made. In 87.5 per cent of these, the patients were first seen in a stage at which no help could be given them. Their symptoms at this time were those of advanced metastatic involvement. It is appalling, indeed, that 87.5 per cent of this small group were too far advanced for curative operation by the time they reached the hospital.

TABLE 4.—*Duration of Symptoms Prior to Seeking Medical Aid*

| Time | Number | Per Cent |
|---|---|---|
| Under 3 months | 4 | 25 |
| Under 6 months | 6 | 37.5 |
| Under 9 months | 3 | 18.75 |
| Under 12 months | 1 | 6.25 |
| Over 12 months | 2 | 12.5 |

## DIAGNOSIS

The only hope of increasing the percentage of cure lies in early diagnosis. A good thorough work-up should start with a complete history

and, if necessary, end with an exploratory thoracotomy. No work-up is complete unless the examination is carried out to the point at which the diagnosis is certain beyond a doubt.[35] A well integrated plan is the first important step toward cure. This plan should include the following items:

1. *History.*—This may include a persistent cough, productive or nonproductive; "cigarette cough;" hemoptysis; dyspnea; chest pain and wheezing; previous attacks of pneumonia; grippe; loss of weight; weakness; or no complaints when examined for other reasons.

2. *Physical Signs.*—These may be minimal, unreliable or (often) absent. However, there may be signs of bronchial obstruction, with or without infection beyond the obstruction; signs of secondary lung infection; signs of pleural involvement, with or without effusion; unilateral wheezing, or signs of mediastinal pressure.

3. *Planned Roentgen Studies.*—The roentgenogram may show rounded lobulated or striated densities, shadows or masses; evidence of atelectasis of one lung, lobe or bronchopulmonary segment; evidence of bronchiectasis or abscess; displacement of the mediastinum. Roentgen studies [36] should include:

*a.* Posteroanterior lateral and oblique films routinely

*b.* Posteroanterior film, taken on inspiration and on expiration, to detect obstructive emphysema, paralyzed hemidiaphragm and impairment of mediastinal mobility

*c.* Bucky or overpenetrated film (for heavy densities and contiguous bone invasion)

*d.* Laminography (to delineate obstructive bronchus or cavitation)

*e.* Roentgenograms of hands and feet (for pulmonary osteoarthropathy)

*f.* Kymocardiography (to exclude pulsating aneurysms)

*g.* Mediastinography (air injection to outline upper anterior mediastinal tumors)

*h.* Angiocardiography (helpful in central para-aortic and paracardiac lesions simulating aneurysms)

*i.* Lipoidal instillations by means of a catheter (to outline bronchial tree and localize site of bronchial to lesion)

*j.* Induced pneumothorax (to differentiate intrapulmonary form extrapulmonary lesions)

4. *Fluoroscopic Examination.*—This is needed to detect early atelectasis, obstructive emphysema, aneurysms, fluid level and paradoxical movement of the diaphragm. A barium swallow is used to detect invasion of the esophagus.

5. *Bronchoscopic Examination.* — This should be performed in every case of undiagnosed chronic cough. Since the majority of primary tumors of the lung are situated in the large bronchi, they can be demonstrated and examined by biopsy if they occur in the primary and secondary bronchi. A more peripherally located tumor can sometimes be brought into view if collapse of the lung is brought about by preliminary pneumothorax. Norris,[37] in a study of 310 cases, observed that tumors of the right and left main bronchi yielded positive bronchoscopic results in 100 per cent of cases; the right and left lower bronchi yielded 88.6 and 86.4 per cent respectively; the right middle lobe bronchus 57 per cent, and the right and left upper bronchi 58.7 and 32.6 per cent respectively. Betts[38] showed that, in a series of 62 cases of histologically verified pulmonary neoplasm, the lesion was seen and a positive preoperative diagnosis made in 74 percent of cases. It may be concluded that the most reliable method of diagnosis is bronchoscopic visualization of the tumor, permitting biopsy of the lesion. Bronchoscopic examination may also be helpful in determining operability, and bronchial secretions may be collected and stained for carcinomatous cells by the Papanicolaou technic. The efficacy of this method has been demonstrated by Farber and his associates,[39] who observed "positive" or suspicious cells in 69 of 414 patients. Pathologic confirmation of the diagnosis of carcinoma of the lung was established in 56 cases. Other investigators[40] have also demonstrated that examination of bronchial secretions is a valuable adjunct to the other means employed in making a diagnosis.

6. *Laboratory Observations.*—The blood picture is not characteristic, as bronchogenic carcinoma rarely causes anemia of any significance. Hochberg,[41] in studying a large number of cases, noted a relatively normal or slightly reduced hemoglobin content, with a corresponding change in the red blood cells. He also observed leukocytosis, with neutro-

philia and a rapid sedimentation rate.

7. *Punch Biopsy.*—Punch biopsy or needle aspiration may be done if the neoplasm extends to the periphery of the lung. Unfortunately, implantation of the tumor cells may follow this procedure. It is therefore justified only if consent for thoroscopic examination or exploratory thoractomy is denied.

8. *Thorascopic Examination.*—If adequate pleural space is created by institution of artificial pneumothorax, it may be possible to determine the site, size and extent of the neoplasm.

9. *Exploratory Thoracotomy.*—If the aforementioned procedures fail to establish the diagnosis, one should not hesitate to do an exploratory thoracotomy; the mortality should be zero, and the information obtained is invaluable. A centrally located rounded shadow or an atelectasis of a small bronchopulmonary segment caused by a carcinoma cannot be diagnosed in an operable stage unless exploration is done as early as possible.

10. *Diagnostic Irradiation.*—Occasionally a large mediastinal mass resembles a malignant lymphoma and is inaccessible to biopsy. Roentgen irradiation may be used as a diagnostic measure to exclude Hodgkin's disease, lymphosarcoma and reticulum cell sarcoma, which regress rapidly.

11. *Study of Pleural Fluid.*—Demonstration of malignant cells in pleural fluid is of value only as a prognostic measure. Usually it indicates late metastasis to the pleura, except when, in a small number of cases, the primary lesion is peripherally located.

## DIFFERENTIAL DIAGNOSIS

Bronchogenic carcinoma notoriously masquerades as benign pulmonary disease. The following conditions must be differentiated from pulmonary neoplasm:

1. Pulmonary tuberculosis
2. Bronchial adenoma
3. Lung abscesses
4. Metastatic carcinoma
5. Primary atypical pneumonia
6. Mediastinal tumors
   a. Lymphocytoma
   b. Lymphatic leukemia
   c. Lymphosarcoma
   d. Hodgkin's disease
   e. Reticulum cell sarcoma
   f. Endothelioma
   g. Fibrosarcoma
   h. Melanosarcoma
   i. Teratoma
   j. Dermoid cysts
   k. Chondroma
   l. Fibroma
   m. Lipoma
   n. Osteoma
7. Pseudotumors
   Aneurysm
   Encapsulated fluid
8. Chronic suppurative lung disease
9. Thyroid and thymic tumors
10. Foreign body aspiration

## REPORT OF TWO ILLUSTRATIVE CASES

*Case 1.—History:* A white man aged 57 was admitted to the hospital complaining of generalized aching pain in the right lower thoracic region, aggravated by coughing. He had apparently been well until four months earlier, at which time he had a chill accompanied with high fever. This was diagnosed as pneumonia and was complicated by pleurisy. He became afebrile and had a nonproductive cough. His "pneumonia" recurred four weeks prior to his entering the hospital. After this he noted that he had lost 7 pounds and had dyspnea on exertion. He coughed constantly and noted frequent nocturnal perspiration, easy fatigability and weakness. Roentgen examination revealed a homogenous shadow of increased density involving the lower half of the right side of the thorax. Bronchoscopic examination revealed a lobulated tumor mass just below the orifice of the right upper lobe. Pneumonectomy was performed, and the specimen showed a hard, firm tumor involving the hilar region of the right middle and lower lobes. There was no evidence of metastasis.

*Comment.*—The patient's complaints, the roentgenographic data and the constitutional symptoms all pointed to the diagnosis of bronchial obstruction. On two former occasions a diagnosis of pneumonia followed by pleurisy had been made. The true diagnosis was not achieved until bronchoscopic examination revealed the actual nature of the disease. This patient was the only one of the 16 in this group who was amenable to surgical intervention and who apparently has fully recovered, since he is alive and well after three years. It

was his good fortune that he had a slowly growing squamous cell carcinoma that had not yet metastasized.

CASE 2.—*History:* A white woman aged 73 was admitted to the hospital complaining of pain in the right side of the chest, hemoptysis of three days' duration, constant cough, extreme anorexia, vomiting of three days' duration, loss of weight and moderate dyspnea. She had been admitted to another hospital three months before. At that time she had complained of anorexia, much gas and belching, nausea and cough. It was noted on physical examination that she had several "lumps" on her forehead and diminished breath sounds in the left side of the chest, with dullness in the lower half. A diagnosis of duodenal ulcer and chronic bronchitis was made, and the cysts on the forehead were surgically removed.

Physical examination on her admission to this hospital revealed dullness to percussion and decreased breath sounds over the entire left side of the chest. There was a mediastinal shift to the left. The patient died, and at autopsy it was seen that she had a primary adenocarcinoma of the left lung, arising from the superior lobe bronchus, with metastases to the right lung, the skull, the brain, the adrenals, the kidneys, the pancreas and the thyroid gland.

*Comment.*—This patient on her first admission to the hospital presented evidence of bronchial obstruction that was not considered at all, the diagnosis being "bronchitis" with emphasis on her gastric complaints and on surgical removal of cysts of the forehead. Undoubtedly this patient was beyond help even at the time of her original admission, but analysis of the case in retrospect fails to provide a plausible reason for the diagnoses of "duodenal ulcer" and "residual bronchitis." Her symptoms were those of metastatic manifestation of bronchogenic carcinoma.

## TREATMENT

The only curative treatment of bronchogenic carcinoma is surgical extirpation. The method of choice is removal of the lung on the affected side, even though the lesion is apparently limited to one lobe. Only by pneumonectomy can the primary cause be adequately removed, since lobectomy does not permit adequate removal of the regional lymph nodes.

Contraindications to pneumonectomy may be divided into three classes: roentgenographic, bronchoscopic and clinical.

Roentgenograhic contraindications include (*a*) paralysis of the homolateral hemidiaphragm; (*b*) local invasion of contiguous ribs, spine, pleura and esophagus; (*c*) distant metastases to ribs, skull, pelvis and vertebrae; (*d*) metastases to the liver, demonstrated by nodulation of the outline of the right hemidiaphragm, and (*e*) bilateral mediastinal or tracheobronchial node extension.

Bronchoscopic contraindications include (*a*) invasion of the trachea by a tumor originating in the upper lobe or bronchus in such a way that the section would necessarily be made through tissue with neoplastic infiltration; (*b*) dilatation of the acute angle of the tracheal bifurcation, which becomes obtuse, indicating neoplastic infraction of the tracheobronchial lymph nodes, and (*c*) rigidity of the tracheal bifurcation and of the bronchial tree, and so-called "woody bronchus" characterized by absence of normal excursion of the trachea and bronchi during respiration.

Clinical contraindications include (*a*) general condition so poor as to render operation too hazardous: (*b*) metastases to other organs; (*c*) metastatic involvement of the axillary or cervical lymph nodes as verified by biopsy; (*d*) paralysis of a vocal cord; (*e*) Horner's syndrome; (*f*) diaphragmatic paralysis; (*g*) hemorrhagic pleural effusion; (*h*) metastases to the skeleton, and (*i*) hemorrhagic pericardial effusion.

The first successful total pneumonectomy for bronchogenic carcinoma was performed by Evarts A. Graham in 1933. The patient, who had a squamous cell carcinoma, is well today, almost sixteen years after the operation. Since then much greater interest has been taken in this condition, because prior to 1933 no successful treatment had been available.

In the last twelve years Ochsner, DeBakey and Dixon[42] have observed 412 patients with carcinoma of the lung. Surgical exploration was carried out in 246; of these, 147 were subjected to primary pulmonary resection. Of those with resectable tumors, 26 per cent survived. The rate of five-year cure was 8 per cent. Graham,[7] reporting on his Barnes Hospital series of 1,117 cases of bronchogenic carcinoma from July 1920 to July 1948, stated

that only about 25 per cent of the patients had undergone pneumonectomy. In about 32 per cent exploration was done, but the cancer was too far advanced for resection of the lung. For the remaining 45 per cent operation was not possible, either because the condition was obviously hopeless or the generally poor physical state of the patient precluded the chance of successful surgical treatment. Lindskog,[43] reporting on a series of 100 unselected primary bronchogenic carcinomas, stated that the comprehensive picture of therapy is still a disappointing one and constitutes a challenge to further efforts. Sixty-five of his patients were hopelessly advanced in the disease and absolutely inoperable. Surgical exploration was carried out in 32 cases, and in 20 of these resection could not be done. Of the 12 patients who were submitted to resection (2 lobectomies), 25 per cent did not survive the immediate postoperative period. After two and one-half to five and one-half years, 3 of the patients had still survived. Gagnon,[44] reporting on 508 patients seen at Toronto General Hospital from 1934 to 1945, recorded only 86 cases in which operation was performed. Of these, resection was possible in only 49, with lobectomy done in 5. Eleven patients are still alive and apparently well, their survival ranging from seven months to eight and one-half years. Waring[45] expressed pessimism as to the prognosis of carcinoma of the lung even when the diagnosis is made early and the surgeon is experienced, stating that at present five-year cures following operation amount to no more than 5 per cent. In the group of 16 cases reported here, treatment was possible in only 2. This consisted of pneumonectomy. One patient survives after three years. Of the remaining 15, survival from time of diagnosis to death is given in Table 5.

TABLE 5.—*Interval Between Diagnosis and Death of Patient*

| Time | Number | Per Cent |
|---|---|---|
| Under 3 months | 8 | 50. |
| Under 6 months | 5 | 31.25 |
| Under 9 months | 1 | 6.25 |
| Under 12 months | 1 | 6.25 |


## SUMMARY

The principal problem of improving results in cases of bronchogenic carcinoma is early diagnosis. Patients should come for help early enough to permit operation. The immediate postoperative mortality in the hands of skilled thoracic surgeons is now no more than that for major abdominal surgery. The medical profession must be educated to recognition of the frequency of this condition and the necessity of early, thorough examination, and the skilled services of clinicians, radiologists, bronchoscopists and surgeons must be coordinated for its prompt detection.

## RÉSUMÉ

La meilleure façon d'améliorer les résultats dans les cas de carcinomes bronchogéniques est de faire un diagnostic précoce. Les malades doivent être soumis à un traitement, suffisamment tôt pour permettre l'opération. Le taux de la mortalité post-opératoire immédiate entre les mains de chirurgiens exercés n'est pas actuellement plus important que pour la chirurgie abdominale sérieuse. La profession médicale doit être éduquée à reconnaitre la fréquence de cette maladie et la nécessité d'un diagnostic précoce. Afin d'assurer ce diagnostic précoce grâce à un examen complet, on doit coordonner entre eux les services éminents que peuvent rendre les cliniciens, les radiologistes, les bronchoscopistes, et les chirurgiens.

## SUMARIO

El problema principal en la reducción de la mortalidad en los cánceres broncogénicos es el reconocimiento de dicha enfermedad en sus comienzos. La mortalidad en el período postoperatorio inmediato, en manos del cirujano competente, hoy en día, no es mayor que la de la cirugia mayor del abdomen. La profesión médica debe de ser educada en el reconocimiento de esta enfermedad y en su importancia.

## RIASSUNTO

Come al solito, il miglioramento nei risultati dei cancri bronchiogeni dipende essenzialmente da una diagnosi precoce.

Il paziente dovrebbe consultare il medico

in tempo per permettere un'operazione radicale. L'immediata mortalita' postoperatoria nelle mani di abili specialisti del torace non dovrebbe ormai superare quella consecutiva ad operazioni addominali. I medici dovrebbero essere allenati nel riconoscere la necessita' di una diagnosi precoce: clinici, radiologi, broncoscopisti e chirurghi dovrebbero coordinare i loro sforzi per accertare la diagnosi.

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# Case Report

## Traumatic Arteriovenous Aneurysm Involving the Humeral Artery

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AN interesting case of arteriovenous aneurysm of traumatic origin, involving the humeral artery, was observed in the hospital of the Santa Casa, in my own service.

### REPORT OF CASE

J. D., a white Brazilian aged 26, a farmhand, was wounded by a shot from a 38-caliber revolver fired at a distance of about 13 yards (12 M.). The bullet penetrated the left arm at the elbow, followed the humeral region in the longitudinal direction, and lodged itself in the region above the scapula, on the same side, and underneath the skin. It was removed the next day by a physician at the local hospital.

The patient said that after the bullet struck him his arm was paralyzed and he could no longer raise it. There was a slight hemorrhage, but his general state was not severely affected by shock and he was able to walk to the hospital. He remained several days, after which he returned home in an apparently satisfactory condition. After a week at home he began to feel pains in the whole arm. At the same time he noticed the growth of a tumor in the region of the middle third of the arm; it increased rapidly in size and soon attained the diameter of an orange. In addition to the tumor there was edema severe enough to deform the entire arm, forearm and hand. A few days later, as his condition grew worse, he was sent by his physician to Sao Paulo and admitted to the Hospital of Santa Casa.

Examination revealed a cicatrix at the bullet's point of entry, on the inner side of the left elbow, and another at the point of exit, in the region of the upper edge of the scapula. The arm, badly swollen, showed in the region of its middle third a large tumor that was hard, virtually painless to pressure and without fluctuation, expansion or thrill. The radial pulse was present, although filiform. The forearm was paralyzed, with numbness of the hand and fingers. The temperature was normal. The possibility of a phlegmon was out of the question, for the skin in spite of its distention was normal in color, and local pain was relatively slight. The white blood cell count revealed no neutrophilia; it was not, therefore, a case of inflammatory tumor. In view of the traumatic nature of the wound, a diagnosis was made of traumatic aneurysm of the humeral artery. Diagnosis of an aneurysm of the limbs is generally easy, since the pathognomonic symptoms—isochronism of pulsation, expansion

Fig. 1.—Arm and forearm showing large swelling.

and thrill—leave no doubt as to the nature of the lesion. In this case, however, these symptoms were wholly lacking.

There was observed on the inner side of the arm only a tumor without well defined limits, merging with the edema that affected the whole limb.

## COMMENT

How can one explain the fact that so large an aneurysm of an important artery, located in a limited region, did not show the classic symptoms that permit a sure diagnosis? One must look to pathologic anatomy for the answer. The aneurysm is a lesion that develops slowly and is nearly always caused by arteritis of syphilitic origin. However, the arterial histologic elements, that is, the internal media and the external layers, react differently to the advent of the inflammatory process. According to the theory of Cormil and Rauvier, the elastic fibers of the media undergo a process of degeneration due to atrophy. The internal and external layers then become sclerotic and fibrous and, having lost their elasticity, are dilated under the force of the blood pressure. The external periarterial inflammatory process then causes adhesions to the neighboring organs, while internally the fibrin clots are deposited in stratified layers. These, increasing the internal resistance of the aneurysmal sac, permit its progressive dilatation without rupture. It is therefore the disappearance of the elastic medial layers of the artery that figures chiefly in the pathogenesis.

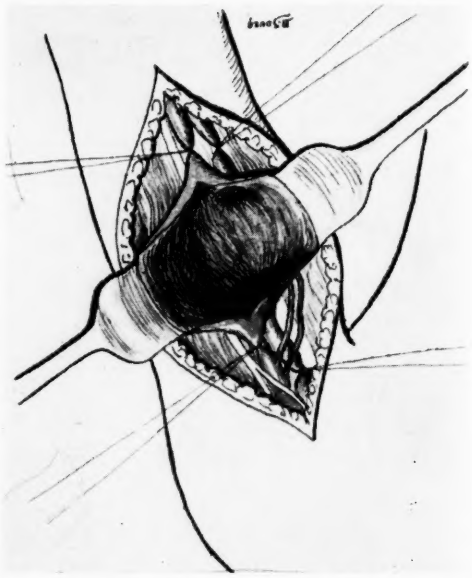

Fig. 3.—Incised aneurysm where arterial and venous blood mix. Ligature of the brachial vein and artery. Two collateral arteries are visible, which will provide nutrition for the limb after ligature of the great vessels.

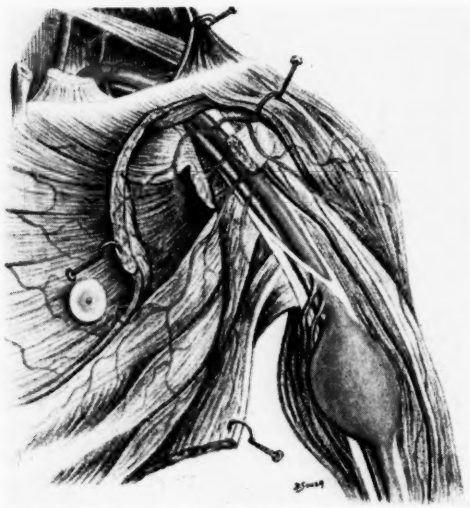

Fig. 2.—Drawing to show size and position of aneurysm located on middle part of arm.

This is what occurs in the usual cases. In the specific case here reported, however, the picture was quite different. Fifteen days after the patient was wounded the aneurysm was already fully developed, having reached the approximate diameter of an orange. The bullet, having gone through the arm in a longitudinal direction, passed between the humeral vein and the humeral artery, injuring them superficially (also longitudinally) so that no hemorrhage took place at the time. Soon afterwards, nature set up its defense; the artery and the vein adhered, forming a large blood sac in a remarkably short time—before the periarterial fibrous adhesions were organized, which, with the external resistance constantly stronger, permit the slow, progressive development of the lesion. The sac,

deprived of this artifice of nature, *broke prematurely*, forming a kind of large *hematoma* contained now by the aponeurosis and by the muscular masses of the region. At the time of rupture the tumor increased greatly in size, and, since the resistance of its capsule was replaced by the much weaker muscular resistance, the pathognomonic symptoms of aneurysm—expansion, pulsation and thrill—failed to appear. Increased compression of the returning network of veins, due to the greater expansion of the ruptured tumor, had yet another consequence; the increase of edema along the whole limb, which sidetracked one still further, and seriously hindered diagnosis.

Under these circumstances, according to Schwartz, the following complications can arise: infection and formation of an abscess next to the sac; gangrene of the limb due to compression of collateral vessels by the tumor; nervous disturbances, such as partial or complete paralysis, accompanied by extremely painful neuritis. These phenomena, according to Pierre Delbet, result from compression and from the chronic inflammatory process that develops around the sac, enfolding the nerve plexus with strong adhesions. In the event of infection of the aneurysm, states Jonselm Schwartz, the diagnosis becomes so delicate a matter that the greatest practitioners have been deceived, mistaking an aneurysm for a simple abscess. He warns surgeons particularly to be suspicious of abscesses located along the important vessels and never to open them without being equipped with the necessary instruments for any eventuality. The great error of opening an infected aneurysm, taking it for an abscess, has been committed many times. In this case, since the aneurysm grew rapidly, we purposely waited several days before operating, so as to allow more time for increase in the diameter of the collaterals, which would have to guarantee the limb's nourishment after ligature of the humeral artery.

Experience has shown that the later the operation in cases of aneurysm the better will be the prognosis, because once the total or partial stoppage of a large vessel is established and the pressure of the bloodstream is increased, the elasticity of the collateral vessels and of the anastomoses commences to function,

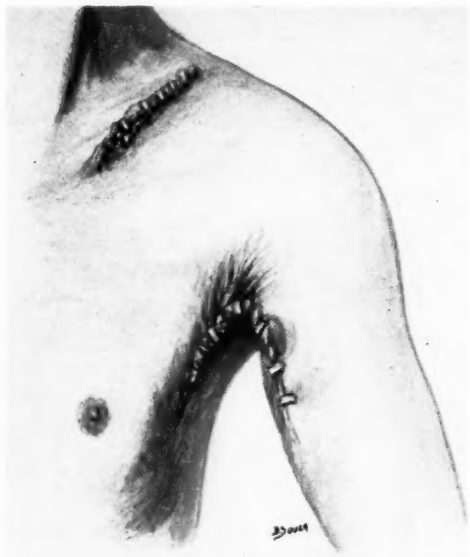

Fig. 4.—Site of provisional ligature (upper scar) of subclavian artery during operation.

Fig. 5.—State of arm when clips were taken off.

increasing their diameter so as to permit passage of an adequate blood supply to the limb. We soon reached, however, the maximum length of time that we could wait; the volume of the tumor was increasing each day and threatening rupture through the skin. We therefore resolved to operate immediately. Owing to the great tension of the aneurysm, we took precautions against a surprise premature rupture of and a resultant hemorrhage, made, as the first stage of the operation, a provisional ligature of the subclavian artery just below the clavicular. This measure would not be necessary in a normal case, but here it was of inestimable service to us, for with this guarantee we could work freely, ligating the humeral artery at its upper end next to the tumor. We opened the large sac, and the rupture of the capsule of the aneurysm was immediately apparent. We removed the voluminous mass of clots and discovered communication between the sac of the aneurysm and the humeral vein, which was wide open for a distance of approximately 1¼ inches (3 cm.). We also tied the humeral vein, cleaned out the cavity of the sac, and closed it with drainage.

In such a case suture of the vein is often advisable. In this case it would have been impossible, not only because of the great length of the venous lesion but because of the anatomic status determined by the adhesions of the vein, artery and nervous plexus to the muscles of the region. Since the bullet followed the longitudinal axis of the arm, it injured not merely the large vessels, the humeral vein and artery, but the nervous plexus as well. Great uncertainty was felt about the result of the operation. Owing to the rapidity of the aneurysm's development and to the fact that operation would require ligature of the limb's two principal vessels, it was feared that gangrene of the arm would occur; that the collaterals, in only twenty-four days, had perhaps not had time to dilate sufficiently. And, in fact, on the first day after the operation the arm and forearm remained inert and cold, and the extremities of the fingers in particular gave the impression of complete ischemia. This state, however, proved to be transitory. On the following day, after treatment with sun lamps and injections of acetylcholine, the temperature soon reached a normal level.

As a rule the damaged circulation itself takes a long while to become reestablished, causing deforming and permanent edema; in this case it built itself up rapidly. The edema existing before the operation soon began to disappear, so that at the end of the week, when the stitches were taken out, the appearance of the arm was completely normal. Cicatrization also took place in a notably short time. Massage and diathermy resulted in great improvement, and the patient, on leaving the hospital, could move his arm. He was able to return to work at the end of two months.


### RÉSUMÉ

On rapporte un cas d'aneurisme artério-véneux traumatique englobant l'artère humérale. L'auteur discute ce cas au point de vue idéologique et donne une description de l'opération employée qui eut un plein succès en dépit de son aspect défavorable.

### SUMARIO

Se presenta un caso de aneurisma arterio-venoso de la arteria humeral de origen traumático. El autor discute el factor etiológico de este caso y describe la técnica operatoria utilizada. El resultado quirúrgico fué muy satisfactorio, no obstante el pronóstico desfavorable de estos casos.

### RIASSUNTO

Riporta un caso di aneurisma artero-venoso di origine traumatica, interessante l'arteria omerale. Discure l'etiologia e la cura di questa complicazione. Nel caso operato dall'A. l'esito e' stato favorevole.


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## Mr. Pepys in the Amphitheater

The famous diary of Samuel Pepys is perhaps as well and widely known as any classic in English literature. It is less widely known that Mr. Pepys was an enthusiastic patron of surgery; yet he was one of the founders of that august scientific body the Royal Society of Britain. He was especially interested in early experiments with the transfusion of blood:

> "November 14, 1666. Dr. Croone told me, that, at the meeting at Gresham College tonight, which, it seems, they now have every Wednesday again, there was a pretty experiment of the blood of one dog let out, till he died, into the body of another on one side, while all his own run out on the other side. The first died upon the place. The other very well and likely to do well. This did give occasion to many pretty wishes, as of the blood of a Quaker to be let into an Archbishop, and such like; but Dr. Croone says, it may, if it takes, be of mighty use to man's health, for the amending of bad blood by borrowing from a better body."

A diary entry of the following year, 1667, speaks of a "poor and debauched man" hired by the College (for twenty shillings) to have sheep's blood injected into his body. "And it is to be done on Saturday next," adds Mr. Pepys with relish; one can almost see him rubbing his hands.

Pepys has been valued chiefly for his quaintness of expression and the naivete of his self-revelations. He deserves to be recognized also as that *rara avis* of his time, a man who could be open-minded about science.

# *Editorial*

## A Matter of Life and Death

THE Greeks had a word for painless and peaceful death: Euthanasia. The euphony of the term has helped to make it a favorite of authors, for it is found in the writings of Thomas More, Bacon, Arbuthnot, Steele, De Quincey, Bailey, Hume, Burke, Jefferson, Carlyle, Disraeli, Macaulay, Lecky, Pope, Byron, Dobell and John Davidson. Formerly, indeed, poets and philosophers were more inclined to advocate euthanasia than were physicians, but of late certain members of the profession seem beguiled by specious arguments for easy death. More alarmingly still, there is a growing tendency on the part of the uninformed public to accept them. The danger lies in neglect of the corollary: An easy and painless death for the sufferer requires an active agent to mete it out.

Is medical science that agent? Can it be? By what authority? With what assurance of justice?

Medicine is not an exact science like mathematics. Patients have "miraculously" recovered when every rational hope was gone. Who among us has not witnessed cases of this kind? We cannot judge all human beings with the same measuring-rod. No scientist can define life. On what possible basis, then, may he presume to destroy it?

Let us give the euthanasia enthusiasts a demonstration. Let us walk with them down a ward filled with "incurables." On the medicine tray is the hypodermic syringe, filled with a death-dealing potion—for of course we are assuming that euthanasia is legal when there seems no hope of cure. Here in the first bed lies Ellen, seventeen. She is a pretty girl, and although she is hopelessly crippled with arthritis, her young life over, in the popular phrase, before it has begun, she is smiling. When life grows dull, Ellen fills the ward with a lilting Irish melody, a folk song of Hungary, or a tender love song from the "land of heather." Down at the other end of the ward lies old Granny McGee, whose legs are useless from ulcers, but who at the sound of Ellen's voice travels back to her girlhood days in the green meadows of Killarney. Shall we still that music and kill two birds with one stone? Well, not just yet, perhaps. We'll think it over.

We pass on to the bed of Mammy Cole, a Negress of the Old South, born of slave parents. Mammy will never rise from her bed of pain. This fact seems somehow to have escaped her notice. She holds a Bible in her horny black hands. "Praise de Lawd fer His goodness to us po' mizzable sinnahs!" she cries, and in still braver crescendo, "Hallelujah!" An illogical joy, perhaps. But is the world so full of delight that we can spare it?

Here is Nellie O'B——, who has inoperable cancer of the liver. There is no earthly hope for Nellie now. Nellie is the widow of a man who, in a drunken rage, murdered his best friend. Day after day the beads of the Rosary slip through the thin white fingers. She is praying for the peace of her husband's soul, for his final forgiveness. We are not in a position to know how long this may take. We have already reached for the syringe; we put it back.

Now meet Mrs. S——, the mother of five children. She does not know that she is soon to die, and probably after weeks of pain and unrest. But we have noted, here in the hospital, that some strong inner compulsion bids her be watchful, and guide and guard her children as never before. We have heard her admonish her sixteen-year-old daughter and her fourteen-year-old son to be thoughtful about the home and to take care of their younger brother and sisters. She bids them be mindful of Tippy, the family dog. The children listen solemnly and nod their heads. They will never forget what their mother tells them

now; may she not have something still to tell them that they will need? As well interrupt a service at a shrine as break in upon what—if anything on earth deserves the name—is a sacred communion.

Our "incurable" patients themselves are our best human arguments. Scientific arguments, however, are not lacking. After all, we can do much to alleviate pain. Has the poppy lost its power in our day? Are there not dozens of drugs that bring restful sleep? Is medicine altogether helpless in its ceaseless warfare against the agony of consuming disease? The "deathbed agonies" of which we hear so much belong largely to fiction and the past.

Our opponents have no patience with this argument. Very well: we can give them two others that cannot be scouted. One is the fact that only by long and continuous observation can we learn the course and progress of disease. "Chronic cases" present a splendid field for study. Time permits us to make comparisons and observations, coupled with a careful and prolonged effort to achieve a specific treatment and so bring the "incurable" disease into the category of the curable. For this reason alone, the legalization of euthanasia would do away with our only true sources of enlightenment; concurring in it, we should defeat our own purposes. In the second place, if euthanasia were the rule, the almost desperate attempt to solve the secret, say of cancer, would disappear. Physicians would not feel the same urge to battle all diseases that bring upon their victims the slow, creeping agony of delayed death. The way out would be too easy. We should lose our vision, and with it our passion for healing and soon our power. It were wise to remember two sayings of the past: "Without vision, the people perish," and "Nothing of value was ever achieved without passion."

Yes, the Greeks had a word for the easy way out of this world. We owe a debt to the Greeks, from Hippocrates down. That majestic language has fed and enriched our own. But this one word is all Greek to the true doctor. He cannot absorb it into his mother tongue.

MAX THOREK

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This body in which we journey across the isthmus between the two oceans is not a private carriage, but an omnibus.—*Oliver Wendell Holmes.*

Medicine is the only profession that labors incessantly to destroy the reason for its own existence.—*James Bryce.*

Nothing is more estimable than a physician who, having studied it from his youth, knows the properties of the human body, the diseases which assail it, the remedies which will benefit it; who exercises his art with caution, and pays equal attention to the rich and the poor.—*Voltaire.*

# New Horizons

## By the Editor

## Medicina Clerica

In 1642, when Sir Thomas Browne wrote his immortal treatise *Religio Medici*, nobody responded with a counter-treatise on medical lore as propounded by the ecclesiastic. This work might still be done by some patient historian with a taste for oddities. More than one eminent gentleman of the clergy has endeavored to conduct his own researches into the mysterious art of healing and the still more mysterious physical construction of man. It is well known among members of the profession that the Rev. Stephen Hales, a curate of the Church of England, was among the first to explore the nature of blood pressure. Mr. Hales, a doughty cleric not to be sidetracked by difficulties, actually performed his experiments on horses without benefit of anesthesia. His *Statical Essays* (1731) contain an account of these enterprises. His writing shows a genuinely scientific spirit.

In the contributions of other well known clergymen of former times—most of them, at least—there was more imagination than science. Bishop Berkeley, for instance, persistently recommended tar-water as a cure for almost every disease man is heir to. "It is of a nature so mild and benign and proportioned to the human constitution, as to warm without heating, to cheer but not inebriate." This quaint panacea was described and recommended energetically in the Bishop's book *Syrius*. John Wesley, the founder of Methodism, believed that doctors made use of high-sounding medical terms merely to confuse the patient and make him willing to pay their exorbitant fees; so he wrote his own medical guidebook, *Primitive Physick, or an Easy and Natural Method of Curing Most Diseases*, which states that the best treatment for cancer of the breast is a cold bath. "This cured Mrs. Bates of Leicestershire of a Cancer in her Breast, a Consumption, a Sciatica, and Rheumatism which she had near twenty Years. . . . She bathed daily for a month and drank only water."

It is to be noted in passing that to bathe every day for a month was then so unusual as to be considered an extreme theapeutic measure. Few of us realize, except when thus reminded, how very recent in the world's history is sanitation.

Nothing is more natural than that the shepherd of souls should interest himself also in the suffering of bodies, but medical science has long since grown too diverse, too complicated, for amateur participation, and hardly an amateur since Mary Baker Eddy has attempted it. Nowadays, when clergymen interest themselves professionally in the work of their medical brethren, it is likely to be in the psychiatric field. A sound knowledge of practical psychology and human motivations is a great aid to the conscientious pastor, and most such pastors fully realize not only its value but the danger that attends its improper use. Sigmund Freud, appalled by the manner in which his teaching had been distorted by the popular mind, remarked to someone shortly before he died, "Of course, you know I am not a Freudian." This same garbling of important discoveries and their implications not only results in many an individual tragedy but is a serious hindrance to the progress of legitimate psychiatric practice and research.

To the credit of the clergy today, however, be it duly acknowledged that psychologic and psychiatric principles as employed by most churches are used cautiously and well, and expert help is recommended when needed. Collaboration between the two professions on this basis is excellent, for medical men are realizing today as never before how intimate is the relation of body, mind and spirit, which are truly interdependent in sickness and health alike. It is hard to imagine a better field for cooperative endeavor.

# A New Pathologic Entity

In these days of organized effort we are sometimes in grave danger of falling mentally and spiritually ill of a disease that is rapidly assuming epidemic proportions. This condition is the more serious because many do not recognize its pathologic nature. Though it is by no means asymptomatic, the symptoms are not painful—quite the reverse, in fact—and so may escape our notice till it is too late. We hear it referred to, almost reverently, as "group thinking."

Now actually there is no such thing as group thinking. Thought is a highly private and personal matter. In our present world situation it is necessary to organize: that is freely granted. But it is not necessary to neglect, as so many are doing, those solitary and unsuspected motions of the mind which call for our deepest and most respectful attention in solitude. All the great achievements of men down the ages have resulted from these visions, these discoveries, these lightning impulses and revelations. The prophet Moses was alone when he saw the burning bush. Archimedes was alone—and in his bath!—when he cried "Eureka!" Semmelweiss was alone and lonely when he made his epic discovery. So it has been and so it must be, forever.

To speak of the "group thinking diathesis" is to coin a phrase, and none too good a phrase at that; but it is hard to avoid the contagion, since one of the main symptoms of the disorder itself is the coining of phrases and the excessive use thereof in endless repetition. When we hear ourselves speaking often of "getting down to the grass roots" or of making "blueprints for cooperation," let us pause to consider whether we mean what we say, or whether this language has been "caught" from others. The shibboleth is no substitute for thought. It cannot produce the new world all the old world is seeking. Nor can it give birth to great ideas and achievements.

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The United States Chapter of the
International College of Surgeons

announces the creation of Junior Membership in the College. The House of Delegates, meeting on Dec. 18, 1949, established this new form of membership, with the following requirements:

*One year of internship in an approved hospital*
*One year as resident surgeon in a specific surgical training program*

Applicants must be between 25 and 30 years of age. For further information, address

Secretary, International Board of Surgery

1516 Lake Shore Drive Chicago 10, Ill.

# Chapter News

## Memorial Honors Paid to De Las Casas

On Wednesday, February 15, 1950, the International College of Surgeons honored the memory of the late Professor Doctor Hernan De Las Casas, former world-wide authority on traumatic surgery and Dean of Medical Science at the University of Caracas, Venezuela. Prof. De Las Casas was killed in a plane crash in March 1947.

Many members of the Chicago medical community gathered at the College Home on Lake Shore Drive to attend the ceremony, which featured the unveiling and dedication of a bronze likeness of Prof. De Las Casas, executed by the noted sculptor, Prof. A. Montagutelli of Paris. Prof. Montagutelli was present and delivered the main address. Others who appeared on the memorial program were Father J. J. Clifford, S.J., of Mundelein, Illinois, who pronounced the invocation; Dr. Luis Alejandro Angulo of Caracas, a former pupil of De Las Casas, who made a formal presentation of the bronze likeness to the College, and Dr. Raymond W. McNealy, Chief Surgeon of Wesley Memorial Hospital, who responded with a speech of acceptance. The memorial bronze, a work of great distinction, was given a place of honor in the College library.

Left to right: General George Lull, Secretary General, American Medical Association; Prof. A. Montagutelli, Caracas and Paris; Dr. Harry M. Hedge, President, Illinois State Medical Society; Dr. Max Thorek, Secretary General, International College of Surgeons; Dr. Raymond W. McNealy, Chief Surgeon, Wesley Memorial Hospital, Chicago.

The dedication ceremony was preceded by a banquet held in the Regency Room of the Drake Hotel, with Prof. Montagutelli as the guest of honor. To all those who attended, the occasion was memorable not only for its memorial significance but for the spirit of international fellowship and good will among surgeons that marked both the dedication ceremonies and the social gathering.

## Brazilian Chapter Organizes

In September 1949, in Sao Paulo, the Brazilian Chapter of the International College of Surgeons was founded. The following officers were elected:

Prof. Carlos Gama, President; Dr. Jose Avelino Chaves, President-Elect; Dr. Sebastiao Hermeto, Jr., Vice-President; Dr. Virgilio Carvalho Pinto, Secretary; Dr. Jose Soares Batista, Second Secretary; Dr. Enrico Branco Ribeiro, Treasurer; Dr. Oscar Cintra Gordinho, Second Treasurer.

Inauguration ceremonies were held in the Municipal Library Auditorium. Prof. Pedro de Calmon, Director of the University of Brazil, attended the launching of the new chapter as guest speaker. His congratulatory and inspirational address was warmly received. Prof. Calmon also distributed diplomas to the charter members. A banquet at Casa Anglo Brasileira next day concluded the event fittingly and enthusiastically, with a large attendance of surgeons and interested friends.

## Finnish Chapter

A meeting of the Finnish Chapter was held in Helsinki on Jan. 29, 1950. Prof. Dr. Gosta Bohansson, F.I.C.S., of Orebro, Sweden, was an honored guest.

During 1949 there were three meetings of the Finnish Chapter, the first on January 29, the second on April 23, and the third on September 10. All were scientific sessions. The following papers were presented:

January 29—Methods of Determining Blood Circulation in Bipedicle dSkin Tubes, by Dr. Atso I. Soivio.

April 23—The Role of Fibrous Tissues in Practical Surgery, by Prof. T. E. M. Kalima.

September 10—The Use of Curare in Connection with Anesthesia, by Dr. E. Turpeinen.

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The Seventh International Assembly

of the

International College of Surgeons

Will Convene

at

Buenos Aires, Argentina

August 1-5, 1950

For travel information, write:

All Nations Travel Bureau

725 First National Bank Building 38 S. Dearborn St., Chicago

Official Travel Representatives, International College of Surgeons

# New Books

**Anus, Rectum, Sigmoid Colon: Diagnosis and Treatment.** By Harry Ellicot Bacon, M.D., F.A.C.S., F.I.C.S., F.A.P.S. Philadelphia: J. B. Lippincott Company, 1949. 2 vol. 3d ed.

Bacon's magnificent work on the anus, rectum and sigmoid colon, dedicated to the memory of his father, the late H. Augustus Bacon, Professor of Operative Surgery, Temple University Medical School, appears in its third edition completely revised and reset.

The field of proctology, always an important specialty, has been vastly enriched during the past few years. Important advances and discoveries were made during the recent war, particularly as to the value and importance of biochemophysiologic equilibrium in patients suffering from disease of the lower bowel. Dr. Bacon, with his customary keen awareness of the perpetually growing need for authoritative sources of information, has spared no pains to improve, enlarge, embellish and modernize a work whose earlier editions met with instant and enthusiastic acclaim on both sides of the Atlantic. He has secured and presented a great number of superb illustrations, many of them in full color. These, together with the excellence of the text, the generous lists of bibliographic references and the handsome format, make his two new volumes something more than merely impressive. This work has as much clinical value to the general practitioner as to the specialist, and as a source book and reference volume the specialist in proctology will find it indispensable.

Since all the material required resetting, it is obvious that no smallest part of it was neglected in revision. From beginning to end it is entirely up to date. New material has been added on the handling of megacolon and megarectum. Conditions of more frequent occurrence, such as the various types of fistula and pruritis ani, are examined in the light of recent etiologic and therapeutic knowledge.

The introduction of the sulfonamides, absorbable and nonabsorbable, and of the antibiotic agents, together with carefully recorded results of their use, has received careful attention. Evaluation of these new aids to proctologic surgery is still more or less tentative.

The relative value of colostomy and proctosigmoidectomy as operations for malignant disease of the lower bowel is discussed in an analytic study of 800 patients over a period of eight years. Dr. Bacon presents the facts without prejudice, explaining that his intention is to lay all the data before the professional reader and leave him to draw his own conclusions as to the method of choice in any particular case.

The sections on malignant disease of the anus, rectum and sigmoid colon are supplied with an unusually fine and varied collection of photographs and photomicrographs of tumor specimens. The histologic descriptions in the accompanying text are detailed and admirably written.

To the philosophic mind, the appearance of a really outstanding medical or surgical text is always more than the mere publication of a book. It represents, in permanent and visible form, a milestone on the invisible highway to truth. Turning over these pages, with their wealth of experience, technical knowledge and scientific accuracy made possible by countless factors never heard of until comparatively recent times, one thinks both reverently and ruefully of the great surgeons of the past, and of what they accomplished with almost no aids at all. Dr. Bacon's book is one of the works which prove that the spirit in which they lived and taught still prevails. For the progressive surgeon and student this work is indispensable.

**Blood Transfusion.** Edited by Geoffrey Keynes. Baltimore: The Williams and Wilkins Company, 1949. Pp. 574; 109 illustrations.

In 1668 the first whole book on the subject of blood transfusion—"a thin quarto volume of 80 pages"—was published in Bologna. Blood transfusion has come a long way since then. The editor of the present volume has brought together the correlated work of a distinguished group of British experts of wide experience in wartime as well as in peace. His personal contribution is a fine opening chapter on the history of this great therapeutic measure. Sections II and III, which concern the indications for blood transfusion and its complications, have been written by Dr. R. Bodley Scott of St. Bartholomew's Hospital. Sections IV and V, on blood groups, blood donors, and transfusions services, are the work of Dr. Hugh Francis Brewer, also of St. Bartholomew's. Mr. Anthony Till of the Radcliffe Infirmary at Oxford has written Section VI, which deals with the technic of transfusion and is followed by a treatise (Section VII) on blood transfusion in infancy, of which Dr. Richard W. B. Ellis of the University of Edinborough is the author. Sir Lionel Whitby of Cambridge contributes Section VIII, which deals with the storage and preservation of blood and its derivatives, and Dr. R. I. N. Greaves follows with Section IX, on blood derivatives and blood substitutes. Section X is again

the work of Dr. Brewer, who explains the organization of a hospital transfusion department.

This aggregation of experience and talent results, quite naturally, in a very fine composite presentation. The book has distinct value both as a text for study and as a reference. One of its outstanding features is an immense bibliography.

**Diagnostic Synopsis of the Acute Surgical Abdomen.** By Bernard J. Ficarra. Springfield, Ill.: Charles C. Thomas, Publisher, 1949. 54 pp.; 7 illustrations.

The diagnosis of acute pathologic conditions of the abdomen, including appendicitis, pelvic disease, perforated peptic ulcer, cholecystitis, colonic lesions, pancreatic disease, intestinal obstruction, peritonitis, trauma and physiologic disturbance, is capably dealt with in this monograph. Dr. Ficarra has made no attempt to cover the field in detail, but he presents, within brief compass, an admirable analysis of the salient points. His introductory chapter emphasizes clinical diagnostic signs and symptoms and the importance of the patient's clinical history. The succeeding chapters apply the general principles of diagnosis to each of the types of abdominal disease listed above.

The monograph, which had its origin in a series of lectures on emergency surgery of the abdomen, is directed primarily to the service of the hospital surgical staff, particularly the interns. It should serve this purpose to their entire satisfaction.

**Essentials of Orthopedics,** By Philip Wiles. Philadelphia: The Blakiston Company, 1949. Pp. 486; 372 illustrations.

As a textbook on orthopedics directed principally to the general practitioner, the undergraduate student and the graduate who is beginning his training as a surgeon, this book should serve an important purpose and need. The author points out that orthopedics is still in its infancy and that a constant interchange of theories and new ideas is necessary to bring it to maturity. He mentions the fact that a few major differences exist in the current practice of the United States and Britain, and regards this as "a healthy sign of the mutual criticism that is not only tolerated but encouraged."

The opening chapter is concerned with postural defects, congenital and acquired; the remainder of the book, with specific pathologic conditions correctible or ameliorable by surgical intervention. The etiologic basis, the clinical symptoms, the diagnosis and the treatment of each lesion are discussed in turn. Great emphasis is placed on the fact that in orthopedics much depends on the patient's steady cooperation. Indeed, Mr. Wiles goes so far as to say that the operation "is but an incident in the course of treatment." This belief has not deterred him, however, from presenting it thoroughly and with conscientious exactness.

**Recent Advances in Otolaryngology.** By R. Scott Stevenson. Philadelphia: The Blakiston Company, 1949. 2d ed. Pp. 395; 114 illustrations.

Technically speaking, Dr. Stevenson's book is a revision, but the changes and additions are so extensive that little of the former work remains; it is therefore entitled to be judged on nearly the same basis as a new work. Its avowed purpose is "to stimulate the interest of medical practitioners in the problems and diseases of the ear, nose and throat, and to bring to their notice recent advances in diagnosis and treatment."

The book strikes a modern note on its opening page, for the initial chapter is devoted to chemotherapy and antibiotics in otolaryngology, especially as applied to Vincent's angina, disease of the nasal sinuses, acute and chronic sinusitis, masked mastoiditis, osteomyelitis, chronic suppurative otitis media and abscess of the brain. Several of the succeeding chapters discuss tests and instruments from a thoroughly up-to-date point of view. The operative technics of such prominent surgeons as Lempert, Sourdille and Popper are detailed. Histopathologic studies are included. Roentgen examination and treatment of cancer of the larynx are evaluated. Cancer of the esophagus receives extended attention.

The author has buttressed his work lavishly with references to other workers and investigators, as well as with illustrations of outstanding quality. This is a compact and highly useful book.

**The Science and Art of Joint Manipulation.** By James Mennell. Philadelphia: The Blakiston Company, 1949. 210 pp. 2d ed., vol. 1. 299 illustrations.

This work deals in a general way with the manipulation, both manual and mechanical, of the joints of the human body in the diagnosis and treatment of various injuries and diseases. The author has had long experience in physical therapy. His chapter on referred pain, covering this ever-present phenomenon as related to many different areas, is particularly interesting. The book is generously supplied with illustrative photographs, roentgenograms, line drawings and diagrams of corrective apparatus. Volume 1 is concerned exclusively with the joints of the extremities.

The author makes a noteworthy distinction between science and art as regards the manipulation of joints. "It is comparatively easy," he observes, "to learn the science of joint manipulation, but the technique of applying the art is by no means so simple. . . . Prolonged practice is the only means of attaining perfection. "

**Atlas of Peripheral Nerve Injuries.** By William

H. Lyons and Barnes Woodhall. Philadelphia: W. B. Saunders Company, 1949.

In this new and very beautiful book, which is largely an outgrowth of World War II and appropriately dedicated to the men who suffered the injuries under discussion, neurologists and neurosurgeons will discover a wealth of up-to-date information on a subject that has been a little neglected. Pathologists also will be interested and stimulated by the authors' painstaking research into the histopathologic picture associated with injuries to the peripheral nerves, especially as a great many of the numerous fine illustrations are photomicrographic.

The material is handled under six main heads: (1) an introduction, dealing with the methods of fixing tissue for examination and the clinical material used; (2) a section on peripheral nerve structure; (3) a discussion of the pathologic picture attending completely severed nerves; (4) a chapter of traumatic nerve lesions in continuity; (5) a chapter on the technic of nerve suturing, and (6) a section on the autografting and homografting of nerves. A good bibliography and a cross-index of the book's contents complete the volume.

Since the book is so lavishly illustrated and so many of the illustrations are photomicrographs of tissue, full descriptive legends accompany each plate and necessarily occupy a great deal of space, but the textual material is not in any way neglected or overcondensed. The authors are continuing their studies and plan in two or three years to publish their later observations and conclusions. Meanwhile, the *Atlas* is a de luxe presentation both in content and in format, a handsome contribution indeed to surgical literature.

**Thomas, Jones and Ridlon.** By H. Winnett Orr. Springfield, Illinois: Charles C Thomas, Publisher, 1949.

This unusual and highly entertaining book, subtitled "On the Contributions of Hugh Owen Thomas of Liverpool, Sir Robert Jones of Liverpool and London, and John Ridlon, M. D., of New York and Chicago, to Modern Orthopedic Surgery," is an altogether pleasant and rewarding addition to the medical man's library. The work and personalities of three oustanding figures in surgical history are presented with an impartial, objective appraisal and with a conscientious effort to bring to light certain long-neglected facts, particularly those concerning Hugh Owen Thomas. Thomas, who spent most of his life in the midst of professional controversy, was a man of great energy, force and determination, although physically frail. His nephew, Sir Robert Jones, robust, urbane and charming, was in many ways his disciple, though perhaps less rigorous in his demands upon himself; according to Dr. Orr, this easier attitude was probably responsible for "concessions, both professional and personal, which Thomas would not have made." John Ridlon, an American surgeon, visited Thomas in England and was deeply impressed with the latter's ideas and methods, as well as with certain apparatus Thomas had devised. Out of this association came much of our present-day information about the value of rest in orthopedic treatment, as well as many practical devices for the preservation of function thereafter.

The book is highlighted by intimate and revealing anecdotes, bringing all three men to life before the reader's eyes. Personal revelations, professional arguments, and facets of personality as revealed by changing circumstances are cleverly interwoven. Of the three personalities, that of Thomas is the most picturesque and memorable, but there is no lack of interest in the other two.

The main portion of the book is supplemented with a paper by Arthur Steindler on "Ridlon and His Share in Moulding Orthopedic Surgery." Ridlon's contributions to the handling of tuberculous disease, infantile paralysis, scoliosis, etc., are discussed in some detail.

The book is illustrated with pen-and-ink-sketches of the three surgeons and line drawings depicting certain orthopedic apparatus. It contains an annotated bibliography of the orthopedic literature.

**Surgical Management of Vascular Diseases.** By Gerald H. Pratt. Philadelphia: Lea & Febiger, 1949. Pp. 496; 181 illustrations.

Basing his work on the conviction that "the most dramatic strides in the recognition and treatment of vascular diseases have occurred during the last decade," the author cites modern developments in intratracheal surgery, intratracheal anesthesia, etc., to substantiate this statement. He points out that many operations are performed today on the heart and the great vessels with excellent and sometimes spectacular results, although formerly these organs were considered practically unapproachable from the surgical point of view. Shunt technics, arterial resections and anastomoses, and electrothermal obliteration of aneurymsal sacs are cases in point.

The resulting book is a compendium of modern technic in the field of vascular surgery. Beginning with a comprehensive tabulation of vascular diseases and their respective nomenclatures, it deals successively with occlusive, vasospastic and circulatory syndromes, proceeding from these to a study of neurovascular disturbances and operations on the sympathetic nervous system. The choice of subjects to be illuminated by illustrations is excellent.

# Abstracts from Current Literature

**Development of Total Pneumonectomy.** Nissen, R.: Am. J. Surg. 78:816, 1949.*

It is seventeen years since total pneumonectomy was first performed. Technically the operation was far from perfect. It was notable chiefly because it was a daring thing to attempt, requiring even more courage on the part of the patient than on that of the surgeon.

I reported the case but published no follow-up. The original technic has now, of course, become obsolete; but it may be of interest, historically at least, to record my experience, especially as only three previous attempts at total pneumonectomy had been reported, all of them unsuccessful.

In 1921 I became associated with Sauerbruch. At that time surgeons were hopeful that a method might be found, in connection with pulmonary resection, to prevent the occurrence of an operative pneumothorax. It soon became apparent that success in these procedures required an obliterated pleura, since this rendered virtually harmless the reopening of the ligated bronchus. Closure of the bronchus being the chief difficulty, separation of the bronchial stump was thought advisable, and it became a routine procedure to obliterate the pleural leaves before performing lobectomy. A great deal of anxiety and ingenuity went into the process. We closed the hilum of the lobe by encircling it with an elastic tourniquet or by mass-constricting ligatures and awaited sequestration of the tissue as a result of devascularization. When this had occurred, the patent bronchial lumen discharged the bronchial contents into a well sequestered operative field. The procedure was cumbersome, but the postoperative mortality rate for lobectomy fell to between 10 and 15 per cent.

In 1929 a one-stage lobectomy in a free pleural space was reported by Harold Brunn. It was immediately realized, at least in the United States and Great Britain, that a considerable advance had been made, less perhaps because of the management of the hilum than because Brunn, wishing to prevent the occurrence of a bronchial fistula, established intercostal subaqueous drainage, thus securing removal of air and exudates and permitting expansion of the remaining lobe.

When confronted with the problem of total pneumonectomy, we were inclined to continue with the old technic, which had the value of successful experience, but it was soon apparent that the deeper problem was a matter of functional pathology. Collapsotherapy and the surgery of traumatic lesions had already demonstrated that the entire lung could be defunctionalized without catastrophe; therefore our concern was not with the loss of respiratory surface involved in pneumonectomy but with the empty space that would be created by loss of the lung. We compared the situation with that present in cases of agenesis of one lung, in which mediastinal shift, elevation of the diaphragm and shrinkage of the thoracic cage had provided effective compensation. But one serious danger remained; the danger of pulmonary embolism resulting from sudden occlusion of the main branch of the pulmonary artery.

Experimental pneumonectomy had been successfully performed by Gluck and by Biondi on rabbits and dogs as far back as 1881 and 1882. These animals, however, do not react to massive pulmonary embolism as does man, and the reports of these successful experimental operations gave little account of the circulatory problem arising from occlusion of a principal artery and two veins. Their emphasis was rather upon compensatory filling of

*EDITOR'S NOTE: In 1948, the late Secretary of the Historical Section of the American Medical Association, Dr. J. C. Trent, arranged a program for the Annual Meeting of the American Medical Association, to which six physicians and surgeons were invited as speakers "who are active in the profession and have themselves contributed significant achievements of our time to the advancement of medical science."

The speakers and their topics were: (1) W. J. Mixter on "Intervertebral Disk"; (2) J. R. Paine on "Continuous Suction Drainage in Intestinal Obstruction"; (3) T. G. Miller on "Intestinal Intubation"; (4) B. Woodhall on "Peripheral Nerve Surgery"; (5) E. B. Astwood on "Antithyroid Drugs," and (6) R. Nissen on "The First Successful Total Pneumonectomy and Its Historical Significance." Dr. Nissen's paper was published in the December 1949 issue of the *American Journal of Surgery* under the title "Development of Total Pneumonectomy."

Although authoritative books on the history of medicine and surgery, such as A. Castiglioni's "A History of Medicine," C. D. Haagensen and W. E. B. Lloyd's "A Hundred Years of Medicine" and Leonardo's "History of Surgery," present the facts correctly, the American surgeon hitherto has been under the impression that E. A. Graham's much publicized case was the first successful total pneumonectomy. Dr. Nissen's operation was performed two years before.

The cuts illustrating this abstract are used by permission of the *American Journal of Surgery*.

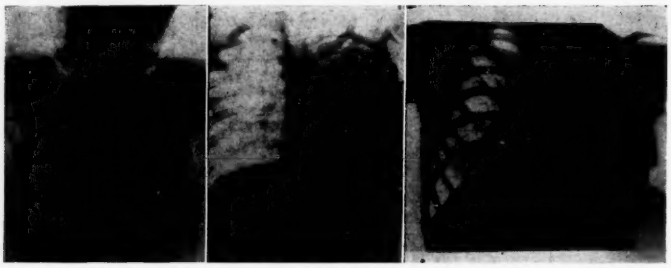

Fig. 1.—*Left,* roentgenogram taken on admission to hospital (Surgical University Hospital of the Charite, Berlin). Pressure pneumothorax on left side, with displacement of mediastinum; mediastinal and subcutaneous emphysema. *Center,* film taken in June 1931, after recovery from immediate consequences of injury. Note that there is bronchiectasis of entire left lung. *Right,* film taken six months after total pneumonectomy (July 21, 1931). Note retraction of mediastinum toward side operated on, extreme elevation of diaphragm and shrinking of left side of thoracic cage.

the empty space in the thorax by the remaining thoracic organs.

## REPORT OF CASE

In July 1931, a girl 12 years old came into my service with severe emphysema of the mediastinum following a crushing thoracic trauma. An incision was immediately made in the neck, which resulted in the liberation of air. Tension pneumothorax indicated the possibility of a tear in the main bronchus of the left lung (Fig. 1, left). Empyema developed in the left pleura, and drainage was established.

For several months thereafter I observed the typical symptoms of chronic pulmonary suppuration. An abscess in the third intercostal space on the left, near the sternum, was drained, the wound communicating with the main bronchus of the left lung. Lipiodol was injected through the fistula and revealed that the entire lung was bronchiectatic (Fig. 1, center). The pulmonary suppuration was obviously referable to bronchostenosis caused by injury to the main bronchus. In spite of the fact that the patient's general condition left much to be desired, it was decided that the whole left lung should be extirpated.

The choice of operation lay between total pneumonectomy and multiple unilateral lobectomy. The latter operation had been made familiar by experience, but, since it would involve leaving a certain number of infected and dilated bronchi in the region of the hilum (because of the low level of dissection) it became evident that the risk of total pneumonectomy must be taken, with the provision that the tourniquet be placed on the hilum at as high a level as possible.

Paralysis of the left side of the diaphragm was induced, and an axillary resection of the third to the fifth rib was accomplished, with no difficulty in separating the lung in spite of the large adhesions. The pedicle of the lower lobe was successfully handled, but, in an attempt to isolate the upper lobe, strong traction on the hilum caused the patient's heart to stop beating temporarily. We discontinued the procedure at once and packed the wound. (I consider it extremely fortunate that this accident occurred before the tourniquet was applied, as otherwise it would have been thought due to occlusion of the blood vessels involved, whereas actually it was the result of a vagal reflex.)

Fourteen days later, on July 21, the second stage of the operation was carried out. By a peripheral approach the upper lobe was freed. When the entire lung had been separated, the hilum was constricted

Fig. 2.—Photograph of same patient, March 1932. Left axillary incision leading to small fistula of left main bronchus is visible (shortly afterward, this fistula closed spontaneously).

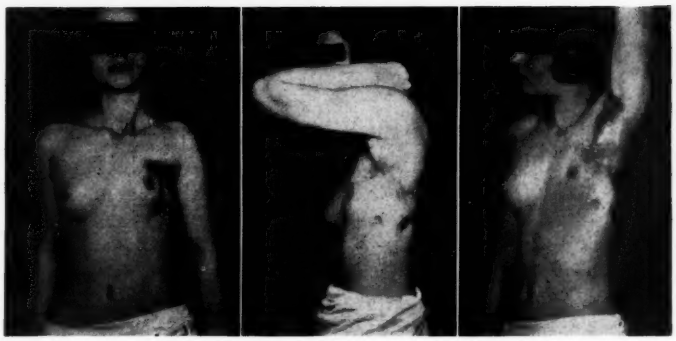

Fig. 3.—Patient in 1937, six years later.

by an elastic tube ligature at a point proximal to the bronchial obstruction. Additional ligatures (silk) were applied peripheral to the elastic one, and the lung was again packed about with gauze.

The patient's temperature reached 39 C. after the operation, and for approximately a week her pulse rate ranged from 140 to 160. There was a rapid decrease in size of the residual cavity, furthered by the rise of the diaphragm and the retraction of the mediastinum toward the operative side (Fig. 1, right). It was therefore unnecessary to perform a thoracoplastic collapse. Eight weeks later there remained only a small fistulous tract leading to the stump of the left main bronchus.

I presented this patient (Fig. 2) at the annual convention of the German Surgical Society on March 31, 1932, and Sauerbruch presented her again in April 1934. By this time spontaneous closure of the fistula had occurred. The latest photograph of this patient (Fig. 3) was taken in 1937, six years later. At this time she was in excellent condition generally, though with some signs of strophy of the left side of the thorax, chiefly apparent in the unequal size of the breasts. I have had no news of this patient since World War II.

The remarkable feature of the second operation in this case was that no acute symptoms occurred as a result of mass ligation of the hilar vessels, not even vagal reflex. Although tachycardia persisted for about a week, no dyspnea was observed. Another feature, thought remarkable at the time but since discovered to be not unusual, was the fact that the empty side of the chest was filled by the remaining organs.

The second successful pneumonectomy was performed one and one-half years later, by Cameron Haight. His patient was a girl aged 13 with diffuse bronchiectasis of the left lung. Essentially Haight followed the same technic, but he chose a different level of mass ligation. He ligated the two lobes separately and left more bronchial tissue. Stenosis

Fig. 4.—Cameron Haight's patient twelve years after total left pneumonectomy performed in 1932. (By permission of Dr. Haight.)

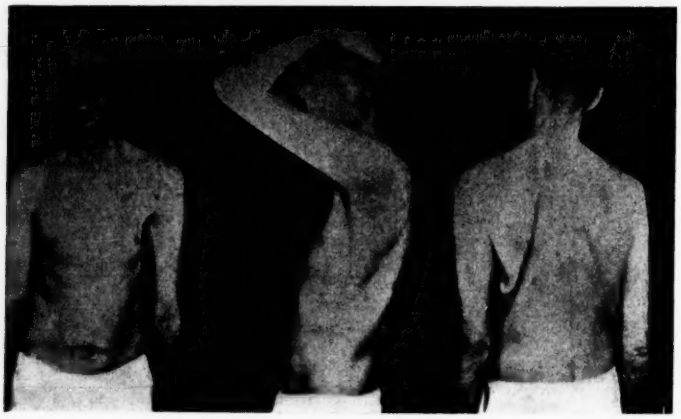

Fig. 5.—Patient of Evarts A. Graham, on whom total pneumonectomy was performed for bronchogenic carcinoma in 1933 (Graham, E. A.; Singer, J. J., and Ballon, H. C.: Surgical Diseases of the Chest. Philadelphia: Lea and Febiger, 1935.

of the main bronchus occurred as in my own case, but there were no undesirable sequelae attributable to the presence of two stumps. The patient is now married, has a child and is in excellent general condition (Fig. 4). She has had no symptoms referable to the lungs since her discharge from the hospital. She is the oldest living person in this country on whom total pneumonectomy has been performed.

In April 1933, Evarts A. Graham performed the third successful pneumonectomy, a one-stage procedure for carcinoma. The operation was a brilliant one and received much well-deserved publicity. The patient, a physician aged 48 (Fig. 5) at the time of writing is practicing his profession in good health, fifteen years after the operation.

Graham's great success was a partial realization of my own hope, and of Haight's, that bronchogenic carcinoma might eventually be successfully extirpated by this procedure. But, although in Graham's case the operation was successful, it must be pointed out that the leaving behind of a large intrapleural stump would obviate success in the majority of cases of carcinoma.

The real peak of significance in the development of this technic, particularly with regard to bronchogenic cancer, was Rienhoff's successful mediastinal dissection. He ligated the three main vessels individually and sutured the main bronchus. His operation for fibrosarcoma in a child aged 3½ years (July 1933) was a complete success and may be said to have marked the end of the experimental phase of pneumonectomy. At present, fifteen years later, few variations of his admirable technic have been suggested, since his method secures perfect hemostasis and allows measurably dependable closure of the bronchus, neither of which had been satisfactorily accomplished before.

The significance, therefore, of the first successful total pneumonectomy is that it may have demonstrated two points: first, that the human organism well tolerates sudden and permanent interruption of one-half of the pulmonary vascular supply, and second, that the empty space formerly occupied by the lung is quickly filled by the other lung's compensatory expansion and by spontaneous displacement of the heart and the diaphragm. These facts may have been of value in encouraging surgeons to modify and improve the technic.

Today, however, the operation has great practical value, for which the credit is due to Rienhoff. My own first total pneumonectomy, performed seventeen years ago, would probably never have been recorded in surgical history but for his modifications of the original technic.

**Ocular Manifestations of Intracranial Injury.** Bryson, J. G., Commander, M.C., N.S.N., *Military Surgeon* **104**:348, 1949.

Intracranial injury has become increasingly frequent in the past few years. The automobile and the airplane have contributed predominantly to this trend, but industrial accidents and war injuries have also been frequent in the military area. Injuries to the head produce a number of changes in the eye and its adnexae, which are of great

importance in determining the severity of cerebral damage, its location and extent, and its prognosis. A review of the possible types of ocular involvement will assist in the performance of a more comprehensive examination and be an aid in the localization of cerebral pathologic change. Examination should include a study of pupil size and reaction, the motor nerves of the eye, other cranial nerves related to the eye, the optic nerve, the visual pathways, the fundus changes and the conjugate eye movements. The ocular sequelae of intracranial injury may include headache, reading difficulties, convergence difficulties, photophobia, nystagmus, vertigo and contractions of the visual field.

ROLAND I. PRITIKIN

**The Diagnosis of Lesions of the Stomach.** Patterson, C. O.; Wilson, F. W.; Haley, A. E., and Rouse, M. O., *Southern M. J.* **42**:19-29, 1949.

The authors present a clinical study based upon 321 consecutive patients who had previously been carefully studied and sent to the authors with a diagnosis of serious gastric disease. Of this group, 33.5 per cent had normal stomachs; 20 per cent had malignant neoplasms of the stomach, and 34 per cent had organic gastric disease other than ulcer or cancer.

The authors present case histories to exemplify the various types of gastric pathology change. They illustrate their observations with well prepared roentgenograms and gastroscopic drawings. The correlation of clinical history, roentgen data, gastroscopic drawings and microphotographs furnishes excellent teaching material.

The authors stress the importance of earlier diagnosis if effective surgical treatment is to be of value, and they call particular attention to the fact that non-neoplastic and nonulcerative disease of the stomach accounted for 34 per cent of all organic lesions observed. It should be obvious that patients in this large group would benefit greatly by proper treatment when the exact diagnosis has been made.

MEYER O. CANTOR

**Scirrhous Carcinoma of the Breast.** Kimble, S. T.: *M. Ann. District of Columbia* **28**:136, 1949.

Metastases from scirrhous carcinoma of the breast may occur many years after removal of the original lesion. Tumors that arise after previous radical removal of a breast cancer should create a suspicion of metastasis.

The author describes a patient in whom a metastatic lesion was found eighteen years after surgical removal of the original lesion. Examination revealed a rectal tumor, but roentgen studies showed other metastases. These metastases were described as representative of mammary carcinoma.

The lesion in the rectum was a metastatic lesion from a carcinoma of the breast, and there were diffuse metastases elsewhere.

M. T. FRIEDELL

**Primary Torsion of the Omentum in Children.** MacLean, A. B.: *Brit. M. J.* **1**:100, 1950.

Because the omentum in the child is usually short, filmy and relatively fat-free, it is rarely involved in primary progressive torsion accompanied by symptoms of acute abdominal disease.

An acceptable explanation for this rare development has not been advanced. It is known that the omentum normally exhibits a purposeless movement which mobilizes its localizing properties toward an intraperitoneal inflammatory process. Payr's theory of hemodynamic torsion is intriguing but without proof.

The condition merits discussion despite its rarity and the relative simplicity of treatment, i.e., resection, because failure of diagnosis even at operation will result when exploration of the upper part of the abdomen is omitted.

When surgically neglected the twisted omentum, with or without infarction, will resolve and become fibrosed.

THOMAS WILENSKY

**Prevention and Relief of Stenosis of Lacrimal Duct.** Firestone, C., *Northwest Med.* **48**:111, 1949.

An operative procedure is described for the prevention and relief of stenosis of the nasolacrimal duct. Severance of this duct produces a sequel of epiphora which will plague the patient the rest of his natural life from a functional, cosmetic and psychologic viewpoint.

The eye and duct are anesthetized by topical anesthesia. A No. 3 lacrimal probe is inserted into the punctum, then through the opening on the lacerated surface of the proximal portion of the torn lid, and through the nasal ostium of the duct into the nose. The probe is fixed by adhesive tape in a position in which it exercises minimal tension on the wound flaps that have been sutured. The probe is left in position for seven days, until healing is sufficient to assure against tissue shifting and resultant stenosis. Ophthalmic ointment is applied and the eye occluded for the seven days, unless indication for inspection of the eye presents itself.

The same procedure is used in stenosis of the duct arising from diseases of the duct or sac or from duct adhesions of unknown origin. The technic of repair has proved 100 per cent effective.

CLAUDE M. WARREN

**Bronchial Adenoma.** Moersch, H. J., and McDonald J. R.: J.A.M.A. **142**:299, 1950.

This paper is based on a review of data on 86 consecutive cases of bronchial adenoma treated at the Mayo Clinic. Forty-five of the patients were men and 41 women. Their ages varied from 15 to 67 years. The average duration of symptoms was thirty months. Six patients were asymptomatic. Seventy-four per cent presented significant roentgenographic pulmonary changes. Tomographic and bronchographic studies were of much value in diagnosis. The adenoma was visualized bronchoscopically in 91 per cent of the cases.

Ninety per cent of these tumors were of the carcinoid type and 10 per cent of the cylindroma type. Adenomas tend to protrude into the lumen of the bronchi. Frequently only a small portion of the tumor projects into the lumen, the greater portion being in the bronchial wall and adjacent pulmonary tissue. The mucosa is usually intact over the tumor. This explains the negative results of cytologic studies of the sputum and bronchial secretions. In 5 cases of this series there was proved metastasis.

Thirty-six of the patients were treated by endoscopic means. Nineteen are still living and have been followed for five to more than ten years. One of the 19 had a recurrence of the tumor and metastasis to the liver. Follow-up has not been complete on 5 of these 36 patients, but they had presented no evidence of recurrence as long as they could be followed, from less than three to ten years. Six of the patients subsequently had recurrence of the adenoma and later required surgical treatment. Five of these died within one year of the onset of treatment, and the other died twelve years later.

Forty-five of the patients were treated primarily by lobectomy or pneumonectomy, and 6 others underwent some type of operation secondary to previous endoscopic treatment. Three patients had surgical exploration only; 2 of these subsequently died. The other patient was later treated endoscopically with diathermy and implantation of radon seeds. This patient is living and well five years after treatment. Forty patients who had surgical treatment are living and well one to twelve years after treatment. Four died one to three years after surgical intervention, and 4 died at the time of operation.

Five of the 86 patients in this series were treated by roentgen therapy alone. Two are living and well fifteen and eighteen years after treatment; another is living fifteen years after treatment but having difficulty, and 2 died two and six years after treatment respectively.

In the author's experience the cylindroma type of adenoma does not respond as well to treatment as does the carcinoid type. Nine of this series had the cylindroma type. Three were treated endoscopically, and 2 died. Six were treated surgically, and 3 of these died later of the disease.

J. O. MORGAN

**Pruritus Ani.** Rosser, C.: South. M. J. **43**:1, 1950.

Proof that pruritus ani is a disease entity is seen in the histopathologic studies reported by several authors. A progressive process is described which resembles neurodermatitis, beginning with an exudative reaction of the skin and subcutaneous layers and ending in atrophy, leukocytic infiltration and multiple shallow epithelial ulcers.

The condition probably is not psychogenic in origin, but its incidence in persons under constant mental stress suggests that the disease may be intensified by mental factors.

The author discusses briefly irradiation of the involved skin, the injection of alcohol, the use of fungicidal drugs and the use of antihistaminic and antiparasitic agents. He expresses the opinion that one or more of these measures, together with the removal of definite anal lesions when present, offers relief when the condition is of moderate severity. However, many persons present themselves whose symptoms are intractable to these measures.

For more than two years the author has attempted to secure relief by a procedure based on the old undercutting operation. In 28 cases he has added to the undercutting operation the implantation of "gelfoam" sponges under the perineal skin, hoping that these sponges would act as a barrier to nerve regrowth. Twenty-five cases were followed. Three patients had complete relief for more than one year, 3 for more than six months and 5 for less than six months. Eight had complete relief followed by mild recurrence, and 6 had complete recurrence of the condition.

J. O. MORGAN

**Ocular Injuries in the Armed Forces.** J.A.M.A. **142**:151, 1950.

In World War I, ocular injuries amounted to 2.14 per cent of the total battle injuries. During World War II, approximately 2 per cent of battle injuries involved the eye, although about 6 per cent of the wounded had maxillofacial injuries. In approximately 80 per cent of cases of blindness the loss of vision could be traced to trauma. Adequate attention and training in safety precautions may have prevented many eye injuries. Proper attention to first aid measures together with early, adequate and specialized care is imperative to the successful preservation of sight.

ROLAND I. PRITIKIN

**The Relief of Pain in Chronic (Calcareous) Pancreatitis by Sympathectomy.** Ray, B. S., and Console, D. A., *Surg., Gynec. & Obst.* **89**:1, 1949.

After a review of procedures formerly used for the relief of intractable pain in chronic pancreatitis, 5 cases are reported, in which the patients were treated in New York Hospital by sympathectomy. Total or partial pancreatectomy had been suggested for relief of pain but is formidable or even unfeasible, as well as depriving the patient of secretions.

Five possible pathways for pain fibers from the pancreas are discussed. The recommended procedure is resection of the twelfth rib with the patient in the lateral position, the pleura being reflected and the crus of the diaphragm detached. The great splanchnic is divided at the celiac ganglion and freed upward for 8 to 10 cm., where it is again divided and removed. The ganglionated chain is divided above the eleventh thoracic and below the first lumbar ganglion and removed. The other side may be done at the same stage unless the patient's condition is especially precarious. Unilateral operation may give temporary or partial relief.

The recommended bilateral procedure may alter the blood pressure in normotensive persons, but after the initial postoperative postural hypotension there should be no untoward effect. The visceral pain from such diseases as peptic ulcer, cholecystitis and appendicitis is eliminated, but other symptoms and signs would still be present to give the physician as much warning as exists in some unsympathectomized patients with the same diseases. Other gastrointestinal, sexual and reproductive functions are not affected in either sex.

The authors conclude that pain from the pancreas is mediated by nerves that traverse the celiac plexus, the splanchnics and the sympathetic chains on both sides. The vagus nerves play no part in transmission of pain from the pancreas. The principal pathway is via the greater splanchnic nerves, but the lesser splanchnic nerves, the lower portion of the thoracic chains and possibly the upper portions of the lumbar chains may also serve as pathways.

The minimal operation found to provide total analgesia of the pancreas and the one proposed as most suitable is bilaterial resection of the chain from the eleventh thoracic to the first lumbar ganglion inclusive, and of the lowest 8 cm. of the greater splanchnic nerves, although unilateral right or left resection may in some patients interrupt enough of the sensory supply to afford relief. While the operation is well suited to the relief of pain in chronic pancreatitis, it is of limited value for carcinoma of the pancreas, chiefly because of the tendency of the disease to spread to pain-sensitive areas supplied by somatic sensory nerves.

W. R. LOVELACE

**The Indications and Technic of Foot Stabilization in Infantile Paralysis.** Ritter, R. O., *Surg. Clin. North America* **29**:269, 1949.

Serious deformitites of the foot have long resisted adequate correction by such measures and devices as conservative manipulation, tendon transplantation, casts or braces. The author states that the time to operate is after all return of muscle power has ceased.

A medial and a lateral incision are generally advocated, and through these careful removal of the cartilage and a minimum of bone is carried out. The backward displacement of the foot and correct apposition to bone, with the foot in the neutral lateral position, is essential. The joints usually fused are the subastragaloid, the astragaloscaphoid and the os calcis cuboid. If need be, the cuneiform joints and the joints between the internal cuneiform and the first metatarsal bones can be fused. In extreme cavus deformity the entire scaphoid and head of the astragalus are taken out.

If the anterior and posterior tibial muscles are paralyzed while the peroneus remains strong and active, tendon transplantation may be used to overcome this defect. The author utilizes the peroneus longus tendon as a dorsiflexor of the foot. The routine procedure is described. The peroneous longus tendon is incised at is lateral insertion. It is then pulled up and out through another incision at about the junction of the middle and lower thirds of the outer, lower part of the leg. Then it is tunneled through to the medial aspect of the foot, going down the sheath of the anterior tibial and out at its insertion. It is anchored into a trapdoor groove in the internal cuneiform.

If the calf muscles are paralyzed and the peronei and the anterior and posterior tibial muscles are active, the latter can be transplanted either singly or together into the tendons of the os calcis and the insertion into the tendon of Achilles and its insertion into the os calcis.

A routine method of closure is advocated, with great care not to allow any of the dressings to act as a constriction about the ankle after the plaster cast is applied and swelling sets in. A well padded plaster cast is used, applied up to the midthigh, with the knee moderately flexed and the ankle in the desired position. Immobilization in the plaster cast is maintained for twelve weeks without weight bearing. After this the cast can usually be taken off generally and an elastic bandage worn until the circulation is normal again.

E. L. JEWETT

**Mesenteric Vascular Occlusion — A Diagnostic Surgical Problem.** Nolan, J. O'L., and St. John, L. A., Connecticut State M. J. **14**:1, 1950.

Mesenteric vascular occlusion may involve only a small segment of intestine or it may extend to massive involvement of the whole superior mesenteric blood supply leading to involvement of the small bowel and the right and transverse segments of the colon. There is no mechanical block, but the motility of the involved bowel is reduced to zero because of the anoxemic muscular paralysis. The superior mesenteric vessel is involved in 95 per cent of cases and may present an embolus or spontaneous thrombosis with equal frequency.

The outstanding symptom is agonizing abdominal pain, colicky at times and tending to be recurrent in its early stages. The pain later becomes steady but no less severe. Vomiting, largely reflex, is usually present. Melena is occasionally seen. Abdominal distention appears early, and signs of shock quickly manifest themselves.

Roentgen studies of the abdomen are of considerable diagnostic value. Areas of the small and large bowel affected by gas distention correspond in outline on the plain film to the anatomic distribution of the superior mesenteric vessels. Frequently the evidence of bowel distention is seen to end abruptly at the junction of the proximal two thirds and the distal third of the transverse segment of the colon. This may even be mistaken for mechanical obstruction of this part of the colon.

The authors feel that a careful consideration of the clinical picture plus prompt roentgen studies will lead to a higher percentage of early correct diagnoses and will offer the patients a greater hope of survival.

J. O. MORGAN

**The Stomach of the Recently Deceased.** Williams, A. W.: Brit. M. J. **1**:102, 1950.

The figures usually cited on the incidence of gastritis are derived from examination of resected specimens in which the presence of peptic ulceration or neoplasm invalidate their general applicability to population groups.

In an effort to standardize the histologic diagnosis of chronic gastritis and to obtain figures indicative of its true incidence and severity in the general population, Williams examined 72 unselected stomachs fixed in formaldehyde by the Magnus technic.

Magnus showed that autolysis begins in the adult within thirty to forty-five minutes of death and that direct intragastric injection of a fixative soon after death is necessary to exclude this factor from histopathologic observations.

Five histologic grades were developed from a detailed study of this material: Grade 1, normal; Grade 2, mild chronic gastritis; Grade 3, more severe chronic gastritis; Grade 4, severe chronic gastritis; Grade 5, very severe chronic gastritis. This is obviously a classification based on parenchymal changes accompanied by inflammatory cell infiltration, in which the lesser grades present considerable difficulties for accurate appraisal. The severe grades are characterized by "intestinalization" of the gastric mucosa, i.e., the appearance of Goblet cells and Paneth's cells. Williams describes "very severe" chronic gastritis as a greatly devastated mucosa with considerable degeneration, atrophy and disappearance of glands and often enormous stuffing of the stroma with chronic inflammatory cells.

Analysis of the necropsy specimens indicated that the severity of histologic lesions tended to increase with age. It has been known for some years that with increasing age there is a diminishing power of gastric secretion and that about 60 per cent of persons above the age of 60 have histamine-fast achlorhydria.

The author has not succeeded in establishing a convincing relation between gastritis and infection, although, like many previous reporters, he states that uremia was invariably accompanied by gastritis, often severe.

One or more ulcers were found in 15 per cent of the adult stomachs. Acute ulcers were present in 4 and chronic ulcers in 7 stomachs. The average age of the patients with ulcers was 67. In no instance had ulcer been diagnosed during life. Of 615 patients with peptic ulcer studied by Avery Jones (1947), two-thirds were male and 33 per cent were over 60. He called attention to the increasing age of the "ulcer population" and to the considerable rise in mortality among patients over 60 who have not had surgical relief.

The present review suggests that the increasing incidence of ulcers in elderly persons is related more to failure of general health than to local factors as indicated by the finding of extensive extragastric infection in 7 out of the 9 cases of gastric ulcer.

Erosions were observed in 18, or 30 per cent, of postnatal stomachs. These showed no physical or situational characteristics, and those without polymorphs were considered to be agonal erosions of vascular origin.

THOMAS WILENSKY

# Armamentarium

**Fat Absorption Accelerator**: Olothorb Capsules (Sharp & Dohme, Philadelphia) contain a preparation alleged to speed up the absorption of fat in the small intestine. Its active ingredient is polyoxethylene sorbitan monooleate, an emulsifying and wetting agent which, when mixed with foods, aids in the emulsification of fats, bringing about a more homogeneous mixture and thereby inducing more complete absorption of fats in patients with chronic disease of the gastrointestinal tract and patients who have undergone certain operations on the intestines. Large amounts of this compound, say the manufacturers, have been administered to patients over a period of months without the appearance of any toxic symptoms and with great benefit to their nutritional status. Among the conditions in which Olothorb Capsules may be of service are ulcerative colitis, ileitis, nontropical sprue, celiac disease and pancreatic fibrosis. After operations on the gastrointestinal tract, the capsules should be of definite value in improving the nutritional status of patients who are unable to gain weight despite the administration of an adequate diet.

This product is supplied in bottles of 100 and 1,000 capsules, each capsule containing 0.5 Gm. of the active medicament.

**Synthetic Cortisone**: The Glidden Company of Cleveland, Ohio, has announced significant progress in its work with the synthesization of the rare cortisone (Kendall's Compound E) on the basis of soybean products. The research staff of the Soya Products Division of this company has already synthesized several new hormonal compounds closely related to cortisone, one of which (Compound S) it is thought may prove an adequate substitute for the former in the treatment of rheumatoid arthritis. The total chemical formula for Compound S differs from that of cortisone by only one oxygen atom. The products are not yet on the market, but arrangements have been completed to distribute the entire available supply to pharmaceutical manufacturers and clinicians, including the U.S. Public Health Institute, so that their possibilities may be tested and determined.

**Furacin Soluble Dressing**: New packaging of Furacin Soluble Dressing (N.N.R.) in a 2-ounce collapsible tube is announced by Eaton Laboratories, Inc., of Norwich, New York. This tube is in addition to the present packaging of the drug in 4-ounce, 1-pound and 5-pound jars. The dressing is an antibacterial preparation for topical application. It contains 0.2% Furacin (brand of nitrofurazone N.N.R.: 5-nitro-2-furaldehyde semicarbazone) in a water-soluble base. It is a nitrofuran, the powerful antibacterial activity of which was discovered at Eaton Laboratories in 1941. Furacin is the first of the nitrofurans to be made available to the medical profession; it is effective against many gram-negative and gram-positive organisms found in surface infections.

Furacin Soluble Dressing is a yellow, water-soluble ointment. It is prescribed for the prophylaxis or treatment of infections of wounds, severe burns, cutaneous ulcers, pyodermas and skin grafts. In addition to its availability as Furacin Soluble Dressing, Furacin is supplied, on prescription, as Furacin Solution (N.N.R.), Furacin Anhydrous Ear Solution and Furacin Vaginal Suppositories.

**Locating Device**: The Guidoscope, an instrument offered by the Guidoscope Corporation of Sullivan, Indiana, is announced as an efficient aid to surgeons in the precise placing of various fixation devices. One method of using the Guidoscope in pinning a fractured femoral neck makes only a small cutaneous incision necessary and the actual operation time is reduced to ten or fifteen minutes. After the fracture has been reduced and the patient immobilized, the Guidoscope is placed in position and its indicator suspended over the approximate location of the fixation device for the taking of anteroposterior and lateral roentgenograms. On these films, measurements are made to determine the magnification of the indicator and the fractured bones and also the relation of the indicator to the desired location of the fixation device. The size of the fixation device is also determined. The Guidoscope is then adjusted to the proper position and, by the use of an adapter, the fixation device is attached to the driver, a small incision is made and the fixation device is driven or screwed exactly to the predetermined position and location. This instrument may also be used to locate and remove foreign bodies.

**Adjunct in Ulcer Therapy**: The National Drug Company of Philadelphia presents Resinat, an adsorbent for the neutralization of excess gastric acidity. This agent, it is claimed, does not cause constipation or produce acid rebound or other undesirable effects. It is available in capsules (0.25 Gm., tablets (0.5 Gm.) and powder (1 Gm.), and has been accepted by the Council on Pharmacy and Chemistry of the American Medical Association.

# In Memoriam

## FRIEDRICH F. BERNHARD

M.D., F.I.C.S.

On December 9, 1949, Prof. Dr. Friedrich F. Bernhard of Giesen, Germany, a Founder Fellow of the German Chapter of the International College of Surgeons, died at the age of fifty-two years. Prof. Bernhard was a pupil of Prof. Poppert, after whose death he succeeded the latter as Director of the Surgical Clinic at the University of Giessen.

Prof. Bernhard made his most distinguished contributions to surgery in the fields of diseases of the biliary passage, serologic diagnosis of carcinoma and surgical treatment of the thorax. Much of his work was genuine pioneering. His research on the genesis of white bile, his critical evaluation of the diagnosis of carcinoma by examination of the blood and his insistence on active surgical intervention in cases of empyema, bullet wounds of the thorax and congenital cardiac disease were of the highest importance. His latest work of outstanding significance was his successful free transplantation of segments of the aorta (Gross) in aortic coarctation.

His remarkable scientific and analytic mind, his freedom from prejudice and his technical dexterity made him the artist and idealist that he was. His compassion for those entrusted to his care earned for him the respect and admiration of the entire surgical world. With other men of like vision, he helped to create the German Chapter of the International College of Surgeons. In the passing of Prof. Bernhard, both the German Chapter and the College as a whole have lost a scientist of notable accomplishments, a great humanitarian and a very great surgeon.

A. LEZIUS, M.D.

Dr. Friedrich F. Bernhard

## CARL GLENNIS ROBERTS

M.D., F.A.C.S., F.I.C.S.

Dr. Carl Glennis Roberts of Chicago, one of Chicago's most distinguished Negro physicians and surgeons, died of a heart attack on January 15, 1950. Dr. Roberts had been a resident of Chicago since 1906 and a practicing surgeon for thirty years before his retirement because of ill health in 1941. He was educated at Valparaiso University and the Chicago College of Medicine and Surgery. He was a member of the surgical staffs of several prominent Chicago hospitals, including the Chicago General Hospital, the Provident Hospital and St. Elizabeth's. He was active in civic, professional and sociological groups as well, and was known as a radio speaker and a contributor to medical and surgical journals.

Dr. Roberts was a member of the American Medical Association, the American College of Surgeons, the Illinois State and Chicago Medical Societies, the Cook County Physicians' Associations (life membership), the Medico-Chirurgical Society, Washington, D. C. (honorary life membership), the National Medical Association, and the Anatomical Demonstrators' Association of Chicago. He was also a Fellow of the International College of Surgeons and a Diplomate of the American Board of Surgery.